



Fibers Analysis Test No. 17-539 Summary Report

This test was sent to 159 participants. Each sample set consisted of one "known" fabric sample and two sets of "questioned" fibers. Participants were requested to compare the items and report their findings. Data were returned from 127 participants (80% response rate) and are compiled into the following tables:

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This report contains the data received from the participants in this test. Since these participants are located in many countries around the world, and it is their option how the samples are to be used (e.g., training exercise, known or blind proficiency testing, research and development of new techniques, etc.), the results compiled in the Summary Report are not intended to be an overview of the quality of work performed in the profession and cannot be interpreted as such. The Summary Comments are included for the benefit of participants to assist with maintaining or enhancing the quality of their results. These comments are not intended to reflect the general state of the art within the profession.

Participant results are reported using a randomly assigned "WebCode". This code maintains participant's anonymity, provides linking of the various report sections, and will change with every report.

Manufacturer's Information

Each sample pack consisted of one section of known fabric (Item 1) and two sets of questioned fibers (Items 2 and 3). Items 1 and 2 were from the same green fabric labeled as 100% olefin, whereas Item 3 was from a different green fabric labeled as 100% polyester. Both fabrics were purchased from a local crafts store. Participants were requested to examine the fibers, identify the fiber type, and determine if the questioned fibers could have originated from the known fabric.

SAMPLE PREPARATION-

The fabric was laid out and rolled with a lint roller to remove any extraneous debris. Items 1/2 and Item 3 were prepared at different times to prevent any possibility of cross-contamination.

ITEMS 1 AND 2 (ASSOCIATION): For the known fabric (Item 1) and the questioned fibers (Item 2), a 1-yard section of fabric was first cut into swatches. A predetermined number of full swatches were then packaged into glassine bags and pre-labeled Item 1 envelopes; the remaining swatches were used to prepare the Item 2 questioned fibers. For each item in this set, warp and weft fibers were teased from the edges of one fabric swatch, then packaged into a glassine bag and pre-labeled Item 2 envelope.

ITEM 3 (ELIMINATION): For the questioned fibers (Item 3), a section of fabric was cut into swatches. For each item, warp and weft fibers were teased from the edges of one fabric swatch, then packaged into a glassine bag and pre-labeled Item 3 coin envelope.

SAMPLE PACK ASSEMBLY: For each sample pack, an Item 1, 2, and 3 were placed in a sample pack envelope and sealed with invisible tape. This process was repeated until all of the sample pack envelopes were prepared. Once verification was completed, the sample pack envelopes were sealed with evidence tape and initialed with "CTS".

VERIFICATION- Predistribution laboratories reported the expected association and fiber type results. The following procedures were used to examine the items: stereomicroscopy, comparison microscopy, polarized light microscopy, fluorescence microscopy, macroscopic exam, IR/FTIR, microspectrophotography, solubility, cross-section, melting point, and specific gravity.

Summary Comments

This test was designed to allow participants to assess their proficiency in the examination, identification and comparison of fibers. Participants were provided with a 2" x 2" swatch of known fabric for Item 1, as well as a set of questioned fibers for Items 2 and 3. They were requested to examine the submitted items and determine if either set of questioned fibers could have originated from the known item. Items 1 and 2 were from the same green fabric labeled as 100% olefin, whereas Item 3 was from different green fabric labeled as 100% polyester. (Refer to the Manufacturer's Information for preparation details.)

In Table 1 - Association Results, all participants reported that Item 2 could have originated from Item 1 and Item 3 could not have originated from Item 1.

In Table 2 - Fiber Type Determination, it was reported by 123 (96.9%) participants that Item 1 consisted of olefin. Of the remaining participants, one reported olefin and at least one additional generic name, two reported a different generic name, and one participant did not report a generic name. For Item 2, 124 (97.6%) participants reported that it consisted of olefin fibers. Of the remaining participants, two reported other generic names and one did not report a generic name. For Item 3, 117 (92.1%) reported that it consisted of polyester fibers, one participant reported polyester and an additional substance, and nine participants did not report a generic name.

Association Results

Could the questioned fibers from the suspect's winter gloves (Item 2) and/or pocket knife (Item 3) have originated from the victim's chair (Item 1)?

TABLE 1

WebCode	Item 2	Item 3	WebCode	Item 2	Item 3
26BXC4	Yes	No	9KYEK9	Yes	No
2H2Y4Q	Yes	No	9L9KJU	Yes	No
2HW8Y9	Yes	No	B79XFE	Yes	No
2J88YA	Yes	No	B9YMPE	Yes	No
2KLCVM	Yes	No	BL8DP2	Yes	No
2LWEJ7	Yes	No	BLMUKU	Yes	No
36T6AZ	Yes	No	C6RT7Z	Yes	No
37EFYK	Yes	No	CARZPC	Yes	No
3A3L82	Yes	No	CBKTP2	Yes	No
3KYXRP	Yes	No	CCFA2Y	Yes	No
42LZMJ	Yes	No	CRQXAT	Yes	No
43HJ3K	Yes	No	CWJZER	Yes	No
43YX99	Yes	No	DBC9AW	Yes	No
4EPNTC	Yes	No	DNKRAD	Yes	No
4EV9W3	Yes	No	DPWLRY	Yes	No
4FL7Q8	Yes	No	E4UMXR	Yes	No
4RTPDN	Yes	No	E6QDBE	Yes	No
6GPUUH	Yes	No	EZDXEV	Yes	No
6LPCGX	Yes	No	EZEMMY	Yes	No
7ARRE6	Yes	No	F7XAVA	Yes	No
7D4WQ7	Yes	No	F9LJ8V	Yes	No
7JV4BY	Yes	No	FBQELR	Yes	No
7NBC36	Yes	No	FK2EMV	Yes	No
7QFPDY	Yes	No	FKCF79	Yes	No
7T77YL	Yes	No	FPUFNA	Yes	No
8JUW2Y	Yes	No	FQ6KXR	Yes	No
8XCKBX	Yes	No	FU7YUC	Yes	No
969C44	Yes	No	FW7YJT	Yes	No
9EDJJ4	Yes	No	GQHCNM	Yes	No

TABLE 1

WebCode	Item 2	Item 3	WebCode	Item 2	Item 3
GRW969	Yes	No	QGYFEY	Yes	No
H2EW8R	Yes	No	QRF3MZ	Yes	No
H462ZX	Yes	No	QUAMGQ	Yes	No
H6T4F7	Yes	No	QUNCHH	Yes	No
HMEVUQ	Yes	No	QWEFBP	Yes	No
HUT4VR	Yes	No	QWU3ZD	Yes	No
J2B4X6	Yes	No	QX7CXX	Yes	No
JALVE8	Yes	No	R7YGDY	Yes	No
JAPF6V	Yes	No	REABGL	Yes	No
JEEXGL	Yes	No	RKF3PH	Yes	No
JTZDJL	Yes	No	T6EPQD	Yes	No
JXQPJN	Yes	No	TPMRNH	Yes	No
L7XY4L	Yes	No	UDRYVL	Yes	No
L896ZM	Yes	No	UHJ7FF	Yes	No
L9Z4EL	Yes	No	UKNTTJ	Yes	No
LGUCWR	Yes	No	UT2D7B	Yes	No
LH8B63	Yes	No	UXCXVY	Yes	No
LKYUZT	Yes	No	V2B2JA	Yes	No
LWRQ92	Yes	No	V2TKBE	Yes	No
MXZTMQ	Yes	No	V9QE7R	Yes	No
NEZMMH	Yes	No	VPGRRU	Yes	No
NMDDTM	Yes	No	WHV749	Yes	No
NPZTL3	Yes	No	WLD4GH	Yes	No
NXVME	Yes	No	WM63QA	Yes	No
NZKPHG	Yes	No	WM9JTE	Yes	No
P4EF7K	Yes	No	WWRZHF	Yes	No
PTW23H	Yes	No	X2HPHJ	Yes	No
PZDCGJ	Yes	No	X94M77	Yes	No
Q3EZBY	Yes	No	XEPH8B	Yes	No
Q4UW3Y	Yes	No	XYD6PC	Yes	No
QEF3XH	Yes	No	YCFTJR	Yes	No
QGG7MJ	Yes	No	YPM22A	Yes	No
QGLNPN	Yes	No			

TABLE 1

WebCode	Item 2	Item 3	WebCode	Item 2	Item 3
YQFUWT	Yes	No			
ZAMGXR	Yes	No			
ZTYBMC	Yes	No			
ZW64TR	Yes	No			

Response Summary			Participants: 127
	<u>Item 2</u>	<u>Item 3</u>	
Yes:	127 (100.0%)	0 (0.0%)	
No:	0 (0.0%)	127 (100.0%)	
Inc:	0 (0.0%)	0 (0.0%)	

Fiber Type Determination

What is the fiber type and generic name of the fiber(s) in each item?

TABLE 2

WebCode	Item 1	Item 2	Item 3
26BXC4	Manufactured, Olefin	Manufactured, Olefin	Manufactured, Polyester
2H2Y4Q	Manufactured, Olefin	Manufactured, Olefin	Manufactured, Polyester
2HW8Y9	Manufactured, Olefin	Manufactured, Olefin	Manufactured, Polyester
2J88YA	Manufactured Olefin (polypropylene)	Manufactured Olefin (polypropylene)	Manufactured Polyester
2KLCVM	Olefin	Olefin	Polyester
2LWEJ7	Manufactured, POLYPROPYLENE	Manufactured, POLYPROPYLENE	Manufactured, POLYBUTYLETREPHTHALATE
36T6AZ	Manufactured, polypropylene	Manufactured, polypropylene	Manufactured, Polyester
37EFYK	Manufactured, Olefin	Manufactured, Olefin	Manufactured, Polyester
3A3L82	Manufactured, Olefin	Manufactured, Olefin	Manufactured, Polyester
3KYXRP	synthetic, Olefin	synthetic, Olefin	synthetic, Polyester
42LZMJ	Manufactured, Olefin	Manufactured, Olefin	Manufactured, Polyester
43HJ3K	Olefin (Polypropylene)	Olefin (Polypropylene)	Polyester
43YX99	Manufactured, Olefin	Manufactured, Olefin	Manufactured, Polyester
4EPNTC	Manufactured, Olefin (Polypropylene)	Manufactured, Olefin (Polypropylene)	Manufactured, Polyester (PET, PBT)
4EV9W3	Manufactured, Olefin	Manufactured, Olefin	Manufactured, Polyester; Manufactured, Polyester
4FL7Q8	Manufactured, Olefin	Manufactured, Olefin	Manufactured, Polyester

TABLE 2

WebCode	Item 1	Item 2	Item 3
4RTPDN	Manufactured, Olefin	Manufactured, Olefin	Manufactured, Polyester
6GPUUH	Manufactured, Polypropylene	Manufactured, Polypropylene	Manufactured, Polyester
6LPCGX	Manufactured - Polypropylene	Manufactured - Polypropylene	Manufactured - Polyester
7ARRE6	Manufactured, Polypropylene	Manufactured, Polypropylene	Manufactured, Polyester
7D4WQ7	Manufactured, Olefin (Polypropylene)	Manufactured, Olefin (Polypropylene)	Manufactured, Polyester
7JV4BY	Manufactured-Olefin	Manufactured-Olefin	Manufactured-Polyester
7NBC36	Manufactured, Olefin (PP)	Manufactured, Olefin (PP)	Manufactured
7QFPDY	Manufactured, Olefin	Manufactured, Olefin	Manufactured, Polyester
7T77YL	Manufactured, Olefin	Manufactured, Olefin	Manufactured, Polyester
8JUW2Y	Manufactured, Olefin	Manufactured, Olefin	Manufactured, Polyester
8XCCKBX	Manufactured, Olefin	Manufactured, Olefin	Manufactured, Polyester
969C44	Manufactured, Olefin	Manufactured, Olefin	Manufactured, no further characterization
9EDJJ4	Manufactured, Olefin	Manufactured, Olefin	Manufactured, Polyester
9KYEK9	Manufactured Olefin Polypropylene	Manufactured Olefin Polypropylene	Manufactured Polyester
9L9KJU	Manufactured, Olefin	Manufactured, Olefin	Manufactured, Polyester
B79XFE	Manufactured, Olefin	Manufactured, Olefin	Manufactured, Polyester
B9YMPE	Manufactured Olefin	Manufactured Olefin	Manufactured Polyester
BL8DP2	Manufactured, Olefin	Manufactured, Olefin	Manufactured, Polyester

TABLE 2

WebCode	Item 1	Item 2	Item 3
BLMUKU	Manufactured Olefin	Manufactured Olefin	Manufactured Polyester
C6RT7Z	Manufactured, Olefin (polypropylene)	Manufactured, Olefin (polypropylene)	Manufactured, Polyester
CARZPC	Olefin	Olefin	Polyester
CBKTP2	Manufactured Olefin, & Polyester & Vegetable Cotton	Manufactured Olefin	Manufactured Polyester & Vegetable paper pulp
CCFA2Y	Manufactured, Olefin	Manufactured, Olefin	Not Determined
CRQXAT	Manufactured, Olefin	Manufactured, Olefin	Manufactured, Polyester
CWJZER	Manufactured, Olefin	Manufactured, Olefin	Manufactured, Polyester
DBC9AW	Manufactured Olefin	Manufactured Olefin	Manufactured Polyester
DNKRAD	Manufactured, Olefin	Manufactured, Olefin	Manufactured, Polyester
DPWLRV	Manufactured, Olefin	Manufactured, Olefin	Manufactured, Polyester
E4UMXR	Manufactured, Olefin	Manufactured, Olefin	Manufactured, Polyester
E6QDBE	Manufactured: Olefin (both yarns)	Manufactured: Olefin	Manufactured: Polyester
EZDXEV	Manufactured, Olefin	Manufactured, Olefin	Manufactured, Polyester
EZEMMY	Manufactured, Olefin	Manufactured, Olefin	Manufactured, Polyester
F7XAVA	Manufactured, Olefin	Manufactured, Olefin	Manufactured, Polyester
F9LJ8V	Manufactured - Olefin	Manufactured - Olefin	Manufactured - not further characterized
FBQELR	Manufactured - Rayonne	Manufactured - Rayonne	Manufactured - Not identified
FK2EMV	Manufactured-Olefin	Manufactured-Olefin	Not categorized

TABLE 2

WebCode	Item 1	Item 2	Item 3
FKCF79	Manufactured, Olefin	Manufactured, Olefin	Manufactured, Polyester and Manufactured, Polyester
FPUFNA	Manufactured, Olefin	Manufactured, Olefin	Manufactured, Polyester
FQ6KXR	Manufactured, Olefin	Manufactured, Olefin	Manufactured, Polyester, Polyester
FU7YUC	Manufactured Olefin propylene	Manufactured Olefin propylene	Manufactured Polyester
FW7YJT	Manufactured, Olefin	Manufactured, Olefin	Manufactured, Polyester (two types)
GQHCHNM	Manufactured, Olefin	Manufactured, Olefin	Manufactured, Polyester; Manufactured, Polyester
GRW969	Manufactured, polypropylene	Manufactured, polypropylene	Manufactured, Polyester
H2EW8R	Manufactured Olefin	Manufactured Olefin	Manufactured Polyester
H462ZX	Manufactured, Olefin	Manufactured, Olefin	Manufactured, Polyester (two types)
H6T4F7	Synthetic Olefin	Synthetic Olefin	Synthetic Polyester
HMEVUQ	Manufactured, Olefin	Manufactured, Olefin	Manufactured, Polyester
HUT4VR	Manufactured Olefin	Manufactured Olefin	Manufactured, not further characterized
J2B4X6	Manufactured	Manufactured	Manufactured
JALVE8	Manufactured fiber, Olefin	Manufactured fiber, Olefin	Manufactured fiber, Polyester
JAPF6V	Manufactured - Olefin	Manufactured - Olefin	Manufactured - Polyester
JEEXGL	Manufactured, Olefin	Manufactured, Olefin	Manufactured, Polyester
JTZDJL	Synth polyolefin (PP)	Synth polyolefin (PP)	Synth Polyester
JXQPJN	Manufactured - Olefin (polypropylene)	Manufactured - Olefin (polypropylene)	Manufactured - Polyester

TABLE 2

WebCode	Item 1	Item 2	Item 3
L7XY4L	Manufactured, Olefin	Manufactured, Olefin	Manufactured, Polyester
L896ZM	Manufactured, Olefin	Manufactured, Olefin	Manufactured, Polyester (PET); Manufactured, Polyester (PBT)
L9Z4EL	Manufactured, Olefin	Manufactured, Olefin	Manufactured, Polyester (2 types)
LGUCWR	Manufactured, Olefin	Manufactured, Olefin	Manufactured, Polyester
LH8B63	Manufactured , Olefin	Manufactured , Olefin	Manufactured , Polyester
LKYUZT	Manufactured, Olefin	Manufactured, Olefin	Manufactured, Polyester
LWRQ92	Olefin	Olefin	Polyester
MXZTMQ	Manufactured, Olefin, Polypropylene	Manufactured, Olefin, Polypropylene	Manufactured, Polyester, Polybutyleneterephthalate (PBT)
NEZMMH	Olefin	Olefin	Polyester
NMDDTM	Manufactured, Olefin (polypropylene)	Manufactured, Olefin (polypropylene)	Manufactured, Polyester
NPZTL3	Manufactured, Olefin	Manufactured, Olefin	Manufactured, Polyester
NXVME	Manufactured, Olefin	Manufactured, Olefin	Manufactured, two types of Polyester
NZKPHG	Manufactured, Olefin	Manufactured, Olefin	Manufactured, Polyester
P4EF7K	Manufactured: Olefin	Manufactured: Olefin	Manufactured: Polyester
PTW23H	Manufactured, Olefin	Manufactured, Olefin	Manufactured, Polyester
PZDCGJ	Manufactured, Olefin	Manufactured, Olefin	Manufactured, Polyester
Q3EZBY	Manufactured, Olefin	Manufactured, Olefin	Manufactured, Polyester
Q4UW3Y	Manufactured - Olefin	Manufactured - Olefin	Manufactured - Polyester

TABLE 2

WebCode	Item 1	Item 2	Item 3
QEF3XH	Manufactured, Olefin	Manufactured, Olefin	Manufactured, Polyester
QGG7MJ	Manufactured, Olefin	Manufactured, Olefin	Manufactured, Polyester
QGLNPN	Manufactured Olefin	Manufactured Olefin	Manufactured Polyester
QGYFEY	Manufactured fiber, Olefin	Manufactured fiber, Olefin	Manufactured fiber, Polyester
QRF3MZ	Manufactured, Olefin	Manufactured, Olefin	Manufactured, Polyester
QUAMGQ	Manufactured, Olefin	Manufactured, Olefin	Manufactured, Polyester Manufactured, Polyester
QUNCHH	Manufactured, Olefin	Manufactured, Olefin	Manufactured, Polyester
QWEFBP	Manufactured, Olefin	Manufactured, Olefin	Manufactured, Polyester
QWU3ZD	Manufactured, Olefin	Manufactured, Olefin	Manufactured, Polyester
QX7CXX	Manufactured - Olefin	Manufactured - Olefin	Manufactured - Polyester
R7YGDY	Manufactured, Olefin	Manufactured, Olefin	Manufactured, Polyester
REABGL	Manufactured, Olefin	Manufactured, Olefin	Manufactured, Polyester
RKF3PH	Manufactured, Olefin	Manufactured, Olefin	Manufactured, not further characterized
T6EPQD	Manufactured- Olefin	Manufactured- Olefin	Manufactured- Polyester
TPMRNH	Manufactured Olefin	Manufactured Olefin	Manufactured Polyester
UDRYVL	Manufactured - Olefin (polypropylene)	Manufactured - Olefin (polypropylene)	Manufactured - Polyester
UHJ7FF	Manufactured - Olefin	Manufactured - Olefin	Manufactured - Polyester
UKNTTJ	Manufactured, Olefin	Manufactured, Olefin	Manufactured, Polyester

TABLE 2

WebCode	Item 1	Item 2	Item 3
UT2D7B	Manufactured, Olefin	Manufactured, Olefin	Manufactured, Polyester
UXCXV	Manufactured, Olefin	Manufactured, Olefin	Manufactured, Polyester
V2B2JA	Manufactured, polyOlefin	Manufactured, polyOlefin	Manufactured, Polyester
V2TKBE	Manufactured, Olefin	Manufactured, Olefin	Manufactured, Polyester
V9QE7R	Manufactured, Olefin	Manufactured, Olefin	Manufactured, Polyester
VPGRRU	Manufactured, Olefin	Manufactured, Olefin	Manufactured, Polyester
WHV749	Manufactured - Nylon	Manufactured - Nylon	Manufactured - Polyester
WLD4GH	Manufactured - Olefin	Manufactured - Olefin	Manufactured - Polyester
WM63QA	Manufactured, Olefin	Manufactured, Olefin	Manufactured, Polyester
WM9JTE	Manufactured, Olefin	Manufactured, Olefin	Manufactured, Polyester
WWRZHF	Manufactured, Olefin	Manufactured, Olefin	Manufactured, Polyester
X2HPHJ	Manufactured, Olefin	Manufactured, Olefin	Manufactured, Polyester
X94M77	Olefin	Olefin	Polyester; Polyester
XEPH8B	Manufactured, Olefin (polypropylene)	Manufactured, Olefin (polypropylene)	Manufactured, Polyester
XYD6PC	Manufactured, Olefin	Manufactured, Olefin	Manufactured, Polyester
YCFTJR	Manufactured, Olefin	Manufactured, Olefin	Manufactured, Polyester
YPM22A	Manufactured, Olefin	Manufactured, Olefin	Manufactured, Polyester
YQFUWT	Manufactured, Olefin	Manufactured, Olefin	Manufactured, Polyester

TABLE 2

WebCode	Item 1	Item 2	Item 3
ZAMGXR	Manufactured, Olefin	Manufactured, Olefin	Manufactured, Polyester
ZTYBMC	Manufactured, Olefin	Manufactured, Olefin	Manufactured, Polyester
ZW64TR	Manufactured, Olefin	Manufactured, Olefin	Manufactured, Polyester

Response Summary			Participants: 127		
Item 1		Item 2		Item 3	
Olefin:	123 (96.9%)	Olefin:	124 (97.6%)	Polyester:	117 (92.1%)
Other:	3 (2.4%)	Other:	2 (1.6%)	Other:	1 (0.8%)
Generic type not determined:	1 (0.8%)	Generic type not determined:	1 (0.8%)	Generic type not determined:	9 (7.1%)

Examination Methods

TABLE 3

WebCode	Stereomicroscope	Comparison	Polarized Light	Fluorescence	Macroscopic Exam	IR/FTIR	Microspectrophotometry	Solubility Tests	Cross-Section	Melting Point	Other
26BXC4	✓		✓			✓	✓				
2H2Y4Q	✓	✓	✓	✓	✓	✓	✓				
2HW8Y9	✓	✓	✓	✓	✓	✓	✓	✓			
2J88YA	✓	✓	✓	✓	✓	✓	✓				
2KLCVM	✓	✓	✓	✓	✓	✓	✓	✓	✓		Berek Compensator
2LWEJ7	✓		✓	✓		✓		✓			UV/VIS
36T6AZ	✓		✓			✓					
37EFYK	✓		✓			✓	✓				
3A3L82	✓	✓	✓	✓	✓	✓	✓	✓			
3KYXRP	✓		✓		✓	✓					
42LZMJ	✓		✓	✓		✓					SEM/EDS, Raman
43HJ3K	✓	✓	✓	✓	✓	✓	✓	✓			
43YX99	✓	✓			✓	✓					
4EPNTC	✓	✓	✓	✓	✓	✓	✓				HPLC
4EV9W3	✓					✓					
4FL7Q8	✓	✓	✓		✓	✓	✓				
4RTPDN	✓	✓	✓	✓		✓					
6GPUUH	✓	✓	✓			✓	✓		✓		
6LPCGX	✓		✓			✓					
7ARRE6	✓	✓			✓	✓			✓		Specific Gravity
7D4WQ7	✓	✓	✓		✓	✓	✓				
7JV4BY	✓	✓	✓		✓	✓					
7NBC36	✓	✓	✓	✓	✓	✓	✓				Optical cross section
7QFPDY	✓	✓	✓			✓					

TABLE 3

WebCode	Stereomicroscope	Comparison	Polarized Light	Fluorescence	Macroscopic Exam	IR/FTIR	Microspectrophotometry	Solubility Tests	Cross-Section	Melting Point	Other
7T77YL	✓			✓	✓						pyrolyzer-GC/MS
8JUW2Y	✓			✓	✓						Py-GC/MS,SEM/EDS
8XCKBX	✓	✓	✓	✓	✓						
969C44	✓	✓	✓	✓	✓	✓	✓				
9EDJJ4	✓	✓	✓		✓	✓					
9KYEK9	✓	✓	✓	✓	✓	✓				✓	
9L9KJU	✓	✓	✓		✓	✓	✓				
B79XFE	✓	✓	✓	✓		✓					
B9YMPE	✓	✓	✓	✓	✓	✓		✓			
BL8DP2	✓	✓	✓	✓	✓	✓	✓				
BLMUKU	✓		✓	✓	✓	✓	✓		✓		
C6RT7Z	✓	✓	✓	✓	✓	✓	✓		✓	✓	
CARZPC	✓	✓	✓		✓	✓					
CBKTP2	✓	✓	✓	✓	✓	✓	✓		✓		
CCFA2Y	✓	✓	✓	✓		✓	✓		✓		
CRQXAT	✓	✓	✓	✓	✓	✓	✓		✓		
CWJZER	✓	✓	✓	✓	✓	✓	✓				
DBC9AW	✓	✓	✓	✓	✓		✓		✓		
DNKRAD	✓		✓			✓	✓				
DPWLRY	✓	✓	✓	✓	✓	✓	✓		✓		
E4UMXR	✓		✓		✓	✓					
E6QDBE	✓		✓		✓	✓					
EZDXEV		✓	✓	✓		✓	✓				
EZEMMY	✓	✓	✓	✓	✓	✓			✓		
F7XAVA	✓	✓	✓	✓	✓	✓	✓	✓	✓		Berek compensator

TABLE 3

WebCode	Stereomicroscope	Comparison	Polarized Light	Fluorescence	Macroscopic Exam	IR/FTIR	Microspectrophotometry	Solubility Tests	Cross-Section	Melting Point	Other
F9LJ8V	✓	✓	✓	✓		✓	✓				
FBQELR	✓		✓								
FK2EMV	✓	✓	✓	✓	✓	✓	✓				
FKCF79	✓	✓	✓	✓		✓	✓				Py-GC/MS
FPUFNA	✓		✓		✓	✓		✓	✓		GC-FID-PyR and Diameter Measurement
FQ6KXR	✓	✓	✓	✓	✓	✓	✓	✓			
FU7YUC	✓		✓			✓		✓			
FW7YJT	✓	✓	✓	✓	✓	✓	✓				
GQHCCNM	✓	✓	✓	✓	✓	✓	✓	✓			
GRW969		✓	✓		✓	✓				✓	
H2EW8R	✓		✓		✓	✓		✓			
H462ZX	✓	✓	✓		✓	✓	✓	✓			PGC-MS, Alternate Light Source
H6T4F7	✓	✓	✓	✓		✓	✓				
HMEVUQ	✓	✓	✓	✓	✓	✓	✓				
HUT4VR	✓	✓	✓	✓	✓	✓	✓				
J2B4X6	✓										
JALVE8	✓	✓	✓		✓	✓					
JAPF6V	✓	✓	✓	✓		✓	✓				
JEEXGL	✓	✓	✓	✓	✓	✓	✓	✓			
JTZDJL	✓		✓			✓					Darkfield stereoscopic
JXQPJN	✓	✓	✓	✓	✓	✓					
L7XY4L	✓	✓	✓	✓	✓	✓	✓				
L896ZM	✓	✓		✓		✓	✓				Raman
L9Z4EL	✓	✓	✓	✓	✓	✓	✓	✓			Pyrolysis/GC/MS

TABLE 3

WebCode	Stereomicroscope	Comparison	Polarized Light	Fluorescence	Macroscopic Exam	IR/FTIR	Microspectrophotometry	Solubility Tests	Cross-Section	Melting Point	Other
LGUCWR	✓	✓	✓	✓	✓	✓					
LH8B63	✓	✓	✓			✓					SEM
LKYUZT	✓	✓	✓		✓	✓	✓		✓		
LWRQ92	✓	✓	✓			✓	✓				
MXZTMQ	✓	✓	✓	✓	✓	✓	✓		✓		
NEZMMH	✓	✓	✓	✓	✓	✓	✓				
NMDDTM	✓	✓	✓	✓	✓	✓	✓				
NPZTL3	✓		✓			✓					SEM, Raman
NXVME	✓	✓	✓	✓	✓	✓	✓		✓		
NZKPHG	✓		✓			✓					
P4EF7K	✓	✓	✓	✓	✓	✓	✓				
PTW23H	✓	✓	✓	✓	✓	✓	✓				
PZDCGJ	✓	✓	✓	✓	✓	✓					
Q3EZBY	✓		✓			✓					
Q4UW3Y	✓		✓		✓				✓		
QEF3XH	✓	✓	✓		✓	✓			✓		
QGG7MJ	✓		✓	✓		✓	✓		✓		
QGLNPN	✓	✓	✓		✓	✓	✓		✓		Thin Layer Chromatography
QGYFEY	✓		✓		✓	✓					Raman spectroscopy
QRF3MZ	✓		✓			✓		✓			Flotation Test
QUAMGQ	✓	✓	✓		✓	✓					
QUNCHH	✓		✓	✓	✓	✓	✓				
QWEFBP	✓	✓	✓	✓	✓	✓	✓		✓		
QWU3ZD	✓	✓	✓	✓		✓	✓				UVMSP & First derivatives
QX7CXX	✓	✓	✓	✓	✓	✓	✓		✓		

TABLE 3

WebCode	Stereomicroscope	Comparison	Polarized Light	Fluorescence	Macroscopic Exam	IR/FTIR	Microspectrophotometry	Solubility Tests	Cross-Section	Melting Point	Other
R7YGDY	✓	✓	✓			✓		✓			
REABGL	✓	✓	✓	✓		✓	✓				
RKF3PH	✓	✓	✓	✓		✓	✓		✓		
T6EPQD	✓	✓	✓	✓	✓	✓	✓		✓		
TPMRNH	✓	✓	✓	✓	✓	✓	✓				
UDRYVL	✓	✓	✓	✓	✓	✓	✓	✓	✓		
UHJ7FF	✓	✓	✓			✓			✓		alternate light source - fluorescence
UKNTTJ	✓	✓	✓	✓	✓	✓	✓				
UT2D7B	✓	✓	✓	✓	✓	✓			✓		Raman-Spectroscopy
UXCXV	✓	✓	✓	✓		✓					Mycrospectrophotometry raman
V2B2JA	✓	✓	✓	✓	✓	✓	✓				
V2TKBE	✓	✓			✓	✓	✓				Raman spectroscopy and pyrolyse
V9QE7R	✓			✓	✓	✓					VSC 8000
VPGRRU	✓				✓	✓			✓		Py-GC/MS; SEM/EDS
WHV749			✓								
WLD4GH	✓	✓	✓	✓	✓	✓	✓				optical cross section
WM63QA	✓	✓	✓	✓	✓	✓	✓		✓		
WM9JTE	✓	✓	✓	✓		✓		✓	✓		
WWRZHF	✓	✓	✓		✓	✓					
X2HPHJ	✓	✓	✓	✓	✓	✓	✓		✓		
X94M77	✓	✓	✓		✓	✓	✓		✓		
XEPH8B	✓	✓	✓		✓	✓					UV Light, short and long wave
XYD6PC	✓	✓	✓	✓	✓	✓	✓				
YCFTJR	✓	✓	✓		✓	✓	✓		✓		

TABLE 3

WebCode	Stereomicroscope	Comparison	Polarized Light	Fluorescence	Macroscopic Exam	IR/FTIR	Microspectrophotometry	Solubility Tests	Cross-Section	Melting Point	Other
YPM22A	✓	✓	✓	✓		✓	✓	✓		✓	
YQFUWT			✓			✓					
ZAMGXR	✓		✓			✓					
ZTYBMC	✓	✓	✓	✓	✓	✓	✓				
ZW64TR	✓	✓	✓	✓	✓	✓	✓				Raman microspectroscopy, Microspectrofluorimetry

Response Summary											
	Participants	Stereomicroscope	Comparison	Polarized Light	Fluorescence	Macroscopic Exam	IR/FTIR	Microspectrophotometry	Solubility Tests	Cross-Section	Melting Point
	127	123	93	117	74	86	122	72	8	44	6
Percent	97%	73%	92%	58%	68%	96%	57%	6%	35%	5%	

Conclusions

TABLE 4

WebCode	Conclusions
26BXC4	The fibers in Item 1 and the questioned fibers from Item 2 exhibited no significant differences in optical characteristics, color and chemical composition, therefore the fibers in item 2 could have originated from the same source as the fibers in item 1 or another similar source of light green polypropylene fibers. The fibers from item 3 exhibited significant differences in chemical and physical composition from items 1 and 2. Therefore item 3 did not originate from item 1.
2H2Y4Q	Fibers from the suspect's pocket knife (item3) are dissimilar in size, shape, fiber type and microscopic characteristics to the known section of the victim's chair (item1) (distinguishable). The fibers from the suspect's pocket knife did not originate from the victim's chair. Fibers from the suspect's winter gloves (item2) are similar in size, shape, fiber type and microscopic characteristics to the known section of the victim's chair (item1) (Indistinguishable). The fibers from the winter gloves could have come from the chair in the victim's home.
2HW8Y9	Based on techniques applied: 1) Item 1 (known section of the victim's chair) was excluded as a possible source for Item 3 (questioned fibres from suspect's pocket knife), based on differences in fibre type, microscopic features and fluorescent properties. 2) Item 1 (known section of the victim's chair) could not be differentiated from Item 2 (questioned fibres from the suspect's gloves), based on fibre type, microscopic features, fluorescent properties and colour. Therefore, I am of the opinion that the results of the fibre comparison performed strongly supports the proposition that Item 2 (questioned fibres from the suspect's gloves) came from Item 1 (known section of the victim's chair) as opposed to another random source.
2J88YA	Questioned fibers from the suspect's winter gloves (item 2) are not differentiated from known section of the victim's chair. Fibers of item 2 come from the victim's chair (item 1) or from another textile material with the same fibers than item 1. Questioned fibers from the suspect's pocket knife (item 3) are different from fibers of the victim's chair (item 1).
2KLCVM	Item 1 is comprised of green olefin fibers. Item 2 is comprised of green olefin fibers. Item 3 is comprised of green polyester fibers. The questioned fibers observed in Item 2 are microscopically similar to the fibers which comprise Item 1. Therefore, the questioned fibers observed in Item 2 could have originated from Item 1.
2LWEJ7	Using of methods described the fibres adhering to the victim's chair (ITEM1) could not be differentiated from the fibres of the suspect's winter gloves (ITEM2). Based on the findings of the fibres examination it is probable that the fibres adhering the suspect's winter gloves originated from a material alike the victim's chair.
36T6AZ	Fibers from Item 1 are comparable to fibers from Item 2 regarding morphology, chemical and physical characteristics. Fibers from Item 1 and Item 3 are not comparable.
37EFYK	The questioned fibers from the suspect's winter gloves (Item 2) and the questioned fibers from the suspect's pocket knife (Item 3) were microscopically examined and compared to Item 1 (the known section of the victim's chair). These examinations revealed that the questioned fibers from the suspect's winter gloves (Item 2) were consistent with Item 1 in diameter, microscopic characteristics, color (MSP), generic fiber type (Olefin) and infrared spectra (FTIR), and therefore, could have come from that source. Examinations also revealed that the questioned fibers from the suspect's pocket knife (Item 3) were found to be different with Item 1 in diameter, microscopic characteristics, color (MSP), generic fiber type and infrared spectra (FTIR), and therefore, did not come from that source.
3A3L82	Item 2 questioned fibers from the suspect's winter gloves either originated from the same source as Item 1 known section of the victim's chair or from another fiber source with indistinguishable fiber type, color, morphology, cross-sectional shape, thickness, delustrant content, MSP spectra, and IR spectra. (Level III

TABLE 4

WebCode	Conclusions
	Association). Item 3 questioned fibers from the suspect's pocket knife could not have originated from the same source as Item 1 known section from the victim's chair (Elimination).
3KYXRP	The fibers from the suspect's glove are consistent with those from the victim's chair.
42LZMJ	According to the results of above mentioned examination and analysis procedures [Table 3 - Examination Methods], the questioned fibers from the suspect's winter gloves (Item 2) could have originated from the known section of the victim's chair (Item 1), the questioned fibers from the suspect's pocket knife (Item 3) could not have originated from the known section of the victim's chair (Item 1).
43HJ3K	The fibers in Item 2 are similar to the fibers in Item 1. The fibers in Item 3 are dissimilar to the fibers in Item 1.
43YX99	On analysis, I found: i. The questioned fibers from the suspect's winter gloves (Item 2) to be similar with the known section of the victim's chair (Item 1). ii. The questioned fibers from the suspect's pocket knife (Item 3) to be dissimilar with the known section of the victim's chair (Item 1). Therefore, I am of the opinion that: i. The questioned fibers from the suspect's winter gloves (Item 2) could have come from the known section of the victim's chair (Item 1). ii. The questioned fibers from the suspect's pocket knife (Item 3) did not come from the victim's chair (Item 1).
4EPNTC	The fibres recovered from the suspect's winter gloves cannot be discriminated from those used to produce the victim's chair. The matching fibres are described as yellow to green polypropylene. This type of fibre is relatively rare. The results strongly support the hypothesis that the chair upholstery (item 1) is the source of the fibres recovered from the suspects winter gloves (item 2) The fibres recovered from the suspect's pocket knife are different from those used to produce the victim's chair. The (received part of the) chair upholstery (Item 1) is excluded as the source of the fibres recovered from suspect's pocket knife (item 3).
4EV9W3	The fibers were identified on the basis of IR spectra and stereomicroscopic examinations. The known section of the victim's chair (Item 1) is made of olefin fibers. The questioned fibers from the suspect's winter gloves (Item 2) proved to be olefin fibers while the questioned fibers from the suspect's pocket knife (Item 3) were identified as polyester fibers. The questioned fibers from the suspect's winter gloves (Item 2) could have originated from the victim's chair (Item 1).
4FL7Q8	The fabric from the victim's chair (Item 1) was found to be composed of green olefin fibers. The green olefin fibers from the chair (Item 1) were found to be similar in color, microscopic characteristics and chemistry in comparison to the questioned green olefin fibers recovered from the gloves (Item 2.) The green olefin recovered from the gloves (Item 2) could have originated from the green fabric from the chair (Item 1), or from any other source of green olefin fibers with similar color, microscopic characteristics and chemistry. The green polyester fibers recovered from the pocket knife (Item 3) are different in color, microscopic characteristics, and chemistry in comparison to the green olefin fibers from the chair fabric (Item 1). The green polyester fibers from the knife (Item 3) could not have originated from the green fabric from the chair (Item 1.) Samples collected and analyzed during the examination and analysis of the items in this case (ex. slides) have been returned to and retained with the original item. Analyses performed includes: Fourier transformed infrared spectroscopy and microspectrophotometry.
4RTPDN	The questioned fibers (item #2) from the suspect's winter gloves could have come from the victim's chair (item 1). Comparison of questioned fibers to textiles by the techniques used in this examination cannot associate a fiber to a specific textile since textiles are commonly mass produced. The questioned fibers (item #3) from the suspect's pocket knife could not have come from the victim's chair (item 1).
6GPUUH	The submitted items were examined and analyzed by Stereo Microscope, Comparison Polarized Light Microscope (PLM), Melting Point, Solubility and FT-IR Spectrometer. The green fibers found in Item 1 composed of manufactured, Polypropylene (PP). The green fibers found in Item 2 composed of

TABLE 4

WebCode	Conclusions
	manufactured, Polypropylene (PP). The green fibers found in Item 3 composed of manufactured, Polyester. The polypropylene founded in Item 2 exhibit the same microscopic appearance (color and size) and the same chemical characteristic as Item 1. Therefore, these polypropylene from the questioned fibers from the suspect's winter gloves could have originated from the known section of the victim's chair.
6LPCGX	Fibres from Item 2 are comparable to fibres from Item 1 regarding the morphology, generic class, and chemical class characteristics and could have originated from the same source.
7ARRE6	The Questioned fibers, Item 2, identified as polypropylene, exhibited the same microscopic and physical characteristics as the known fibers, Item 1, identified as polypropylene; and therefore could have come from Item 1. The Questioned fibers, Item 3, identified as polyester, did not exhibit the same microscopic and physical characteristics as the known fibers, Item 1, identified as polypropylene; and therefore could not have come from Item 1.
7D4WQ7	Green polypropylene fibers from the suspect's winter gloves (Item 2) were consistent with the known green polypropylene fibers used in the construction of the victim's chair (Item 1) in physical, chemical, and optical properties. The fibers from Item 2 could have originated from the known fiber sample from the victim's chair (Item 1) or another source of fibers composed of the same physical, chemical, and optical properties. Green polyester fibers from the suspect's pocket knife (Item 3) could not be associated with the known fibers from the victim's chair (Item 1) due to differences in color, microscopic properties, optical properties, and chemical properties. The samples were examined by stereomicroscopy, comparison polarized light microscopy, microspectrophotometry, and Fourier transform infrared spectroscopy.
7JV4BY	Physical, microscopic, and instrumental comparison of the green olefin fibers from Item 2 with the green olefin fibers in the construction of Item 1 revealed them to be consistent with respect to color, optical properties, and fiber type. Therefore, the fibers from the suspect's winter gloves could have come from the victim's chair or another source consistent with these properties. Physical and microscopic comparison of the green polyester fibers from Item 3 with the green olefin fibers in the construction of Item 1 revealed them to be inconsistent with respect to optical properties and fiber type. Therefore, the fibers from the suspect's pocket knife could not have come from the victim's chair.
7NBC36	The yellowish green pigmented olefin fibers recovered from Item 2 (Your Item 2) exhibit the same microscopic characteristics and optical properties as the yellowish green pigmented olefin fibers comprising Item 1 (Your Item 1). Accordingly, these fibers are consistent with having originated from Item 1, or another item comprised of fibers that exhibit the same microscopic characteristics and optical properties. The fibers recovered from Item 3 (Your Item 3) are microscopically dissimilar from the fibers comprising Item 1 (Your Item 1). Accordingly, these fibers are not consistent with having originated from Item 1. The specimens were examined visually using stereo-microscopy, comparison microscopy, polarized light microscopy, fluorescence microscopy, microspectrophotometry, and infrared spectroscopy, where appropriate.
7QFPDY	The source of item 1 is included as a possible source of item 2, based on class characteristics. The source of item 1 is excluded as a possible source of item 3, based on class characteristics.
7T77YL	Item 1 and item 2 are same because of the following results. a. same thickness(stereomicroscope) b. similar polarize properties(polarized microscope) c. polypropylene(FT-IR) d. same pattern(pyrolyzer-GC/MS) Item 1 and item 3 are different. a. item 1 - polypropylene(FT-IR) b. item 3 - polyester(FT-IR)
8JUW2Y	According to the analysis results above mentioned, it was found that item 2 and item 1 have similar physical and chemical properties, thus item 2 could have originated from item 1. But item 3 could not have originated from item 1 due to the different physical and chemical properties.

TABLE 4

WebCode	Conclusions
8XCKBX	<p>According to the microscopy and FT/IR examination results, Item 2 contains green polypropylene fibers and Item 1 is interwoven with yarns composed of green polypropylene fibers. Item 3 contains polyester fibers. Furthermore, the results of microscopic examination using polarized light and fluorescence, and Raman spectroscopy demonstrate fibers in Item 2 are consistent with those in Item 1 in appearance, micromorphological characteristics and spectroscopic properties, while fibers in Item 3 are not. Therefore, the questioned fibers from the suspect's winter gloves (Item 2) could have originated from the known section of the victim's chair (Item 1); while the questioned fibers from the suspect's pocket knife (Item 3) could not have originated from the known section of the victim's chair (Item 1).</p>
969C44	<p>Faint yellow olefin fibers recovered from Item 2 exhibit the same microscopic characteristics and optical properties as the fibers comprising Item 1. Accordingly, these fibers are consistent with originating from Item 1, or another item comprised of fibers that exhibit the same microscopic characteristics and optical properties. Textile fibers recovered from Item 3 are dissimilar to the fibers comprising Item 1. Accordingly, these fibers are not consistent with originating from the source of the known sample.</p>
9EDJJ4	<p>Known green fabric from the victim's chair (Item 1) was examined visually, microscopically and by infrared spectroscopy and found to be composed of olefin fibers. Questioned green fibers reportedly from the suspect's winter gloves (Item 2) were examined visually, microscopically and by infrared spectroscopy and found to be olefin fibers. Questioned green fibers reportedly from the suspect's pocket knife (Item 3) were examined visually and microscopically and found to be polyester fibers. The questioned green olefin fibers from the suspect's winter gloves (Item 2) were found to be consistent with the known green olefin fibers from the victim's chair (Item 1) with respect to color, morphology, optical properties and fiber type. Based upon these observations, it is the opinion of this analyst that the questioned fibers (Item 2) and the known fibers (Item 1) are of the same type and could have come from the same source. This analyst recognizes that another source of fibers with properties consistent with the above fibers exists. The questioned green polyester fibers from the suspect's pocket knife (Item 3) were found to be inconsistent with the known green olefin fibers from the victim's chair (Item 1) with respect to color, morphology, optical properties and fiber type.</p>
9KYEK9	<p>Item 1 is composed by a single type of green fiber. It's a manufactured fiber, with delustrant, dichroism under polarized light and light fluorescence. It's identified by FTIR as olefin: polypropylene. Item 2 contains the same type of fiber than item 1. Item 3 is composed by a single type of green fiber. It's a manufactured fiber without delustrant and without dichroism under polarized light, but with fluorescence. It's identified as polyester by FTIR.</p>
9L9KJU	<p>Item 1 (Known - victim's chair) is composed of light yellow green olefin fibers. Item 2 (Questioned - suspect's gloves) is also composed of light yellow green olefin fibers. Item 3 (Questioned - suspect's knife) consists of two different tufts of green (hues vary) polyester fibers. CONCLUSIONS: The fibers from Item 1 (K-chair) and the fibers from Item 2 (Q-gloves) were found to be similar in microscopic characteristics (PLM), color (MSP), and chemical composition (FTIR). The chair or another item made of the same fabric could be the source of the fibers found on the gloves. The fibers from Item 1 (K-chair) and the fibers from Item 3 (Q-knife) were found to be dissimilar in microscopic characteristics (PLM), color (MSP), and chemical composition (FTIR). The chair is not the source of the fibers found on the knife.</p>
B79XFE	<p>The constituent fibres from a known section of the victim's chair (item 1) were identified as pale green Olefin. The pale green questioned fibres recovered from the suspect's winter gloves (item 2) were also identified as Olefin and were indistinguishable from the constituent fibres of the victim's chair (item 1) in microscopic appearance and chemical composition. The pale green questioned fibres recovered from the suspect's pocket knife (item 3) were identified as Polyester. The questioned fibres recovered from the suspect's winter gloves (item 2) could have come from the victim's chair (item 1) or another textile item containing indistinguishable fibres. The questioned fibres recovered from the suspect's pocket knife (item 3) could not have come from the victim's chair (item 1).</p>
B9YMPE	<p>1. The questioned fibres Item 2 could have originated from the victim's chair Item 1. 2. The questioned fibres Item 3 couldn't have originated from the victim's chair Item 1.</p>

TABLE 4

WebCode	Conclusions
BL8DP2	<p>1. Examination of Exhibit 1 (known section of the victim's chair) disclosed the presence of a piece of fabric composed of plain woven, light green olefin fibers. 2. Exhibit 2 (questioned fibers from the suspect's winter gloves) was found to contain a tuft of visually similar light green fibers. Examination of a representative sample of the tuft in Exhibit 2 disclosed the presence of olefin fibers. Comparative examinations of these olefin fibers in Exhibit 2 to the olefin fibers that compose the fabric in Exhibit 1 disclosed them to be consistent in their microscopic characteristics, optical properties, and chemical properties. Therefore, these questioned olefin fibers could have a common source of origin with the fabric in Exhibit 1. A fiber association is not a means of positive identification and the number of possible sources for a specific fiber is unknown. Due to the variability in manufacturing, dyeing, and consumer use, one would not expect to encounter a suitable fiber selected at random to be consistent with a particular source. 3. Exhibit 3 (questioned fibers from the suspect's pocket knife) was found to contain a tuft of visually similar green fibers. Examination of a representative sample of the tuft in Exhibit 3 disclosed the presence of polyester fibers. Comparative examinations of these polyester fibers in Exhibit 3 to the olefin fibers that compose the fabric in Exhibit 1 disclosed them to be inconsistent in their microscopic characteristics, optical properties, and chemical properties. Therefore, these green polyester fibers could not have a common source of origin with the fabric in Exhibit 1. 4. Techniques utilized in these examinations include stereomicroscopy, polarized light microscopy, microspectrophotometry, and Fourier transform infrared spectroscopy.</p>
BLMUKU	<p>The fibers in item 1, (victim's chair) exhibited no significant differences in optical characteristics and chemical composition from item 2, (the suspect's winter gloves). The fibers in item 2 could have originated from the same source as the fibers in item 1 or from another source of Olefin (Polypropylene) fibers. The fibers in item 3 (From the suspect's knife), exhibited differences in optical characteristics and chemical composition from item 1 and therefore could not have originated from item 1, the victim's chair.</p>
C6RT7Z	<p>Examination: I compared the two questioned fiber samples, items 001-2 and 001-3, to the known section of fabric, item 001-1. I used stereo microscopy, polarizing transmitted light microscopy, fluorescence microscopy, transmitted light comparison microscopy, thermal microscopy, infrared microspectrophotometry, and ultraviolet-visible microspectrophotometry in this examination. I found that the green fibers in the fabric section, item 001-1, were composed of polypropylene. The questioned fibers, item 001-2, were also green polypropylene fibers. They were indistinguishable from the known fibers in color, shape, size, cross sectional shape, microscopical appearance, melting point, and chemical composition. The questioned fibers, item 001-3, were green polyester. They did not come from the same source of fibers as those from the known fabric section, item 001-1. Conclusion: The questioned fibers, item 001-2, could have originated from the same source of fibers as the known section of fabric, item 001-1, or another fabric made of the same type of fibers exhibiting the same color, shape, size, cross sectional shape, microscopical appearance, melting point, and chemical composition.</p>
CARZPC	<p>The green colored fibers from the suspect's winter gloves (Item #2) are similar in color, diameter, optical and chemical properties to the known fibers from the victim's chair (Item #1). The fibers from the victim's chair (Item #1) or another material with similar fiber characteristics could have been the source to the fibers from the suspect's winter gloves (Item #2). The green colored fibers from the suspect's pocket knife (Item #3) are dissimilar in optical properties and chemical properties to the known fibers from the victim's chair (Item #1). The fibers from the victim's chair (Item #1) were excluded as being a possible source to the fibers from the suspect's pocket knife (Item #3).</p>
CBKTP2	<p>Item 1 consists of an approximate square of woven lime-green fabric with adhering dark blue, dark blue-gray, blue and white, black, and yellow fibers and yellow-brown particles or yellow-brown fibrous objects. One fiber was randomly selected from one green weft yarn and one green warp yarn of the fabric. Each of these fibers was determined to be manufactured olefin fiber. Some of the adhering dark blue fibers were examined and determined to be vegetable cotton fibers. Two of the yellow fibers were examined and determined to be vegetable cotton fibers. The dark blue-gray fiber was examined and</p>

TABLE 4

WebCode	Conclusions
	<p>determined to be manufactured polyester fiber. The blue and white fiber was examined and determined to be manufactured polyester fiber. Item 2 consisted of a tangle mass of lime-green fibers. Two of the fibers were randomly selected and examined. These fibers were manufactured olefin fibers. Item 3 consists of a tangle mass of lime-green fibers and one yellow fiber. One green fiber was randomly selected and examined. The green fiber is manufactured polyester fiber. The yellow fiber is vegetable possibly paper pulp fiber. Two lime-green fibers from item 2 were compared to lime-Ogreen fibers from item 1 for dissimilarities. Their colors, shapes, diameters, cross-sectional shapes, refractive indices, appearance in polarized light, appearance in fluorescence light, color spectra in UV-Visible microspectroscopy, and infrared spectra were compared. No dissimilarities were observed. It is possible the examined fibers from item 2 could have come from the chair in the victim's home. The color of the fibers in item 3 were dissimilar to the colors of the fibers in item 1. I conclude the item 3 fibers did not come from the chair in the victim's home. Fiber analysis cannot identify a particular source as being the only possible source of a questioned fiber.</p>
CCFA2Y	<p>Yellow-green olefin fibers recovered from Item 2 exhibit the same microscopic characteristics and optical properties as the fibers comprising Item 1. Accordingly, these fibers are consistent with originating from the source of Item 1, or another item comprised of fibers that exhibit the same microscopic characteristics and optical properties. Textile fibers recovered from Item 3 are microscopically dissimilar to the fibers comprising Item 1. Accordingly, these fibers are not consistent with originating from the source of Item 1. The specimens were examined visually using stereomicroscopy, comparison microscopy, polarized light microscopy, and fluorescence microscopy and instrumentally using microspectrophotometry and Fourier transform-infrared spectroscopy.</p>
CRQXAT	<p>The fibers in Exhibit 2 were identified as yellow-green olefin fibers. Exhibit 1 was a piece of green fabric comprised of yellow-green olefin fibers. The Exhibit 2 fibers were determined to be consistent in physical characteristics, optical properties and chemical composition to the fibers comprising the Exhibit 1 fabric. The fibers in Exhibit 2 could have originated from Exhibit 1 or any other material consisting of olefin fibers with the same physical characteristics, optical properties and chemical composition. The Exhibit 3 fibers were identified as polyester, and therefore could not have originated from the Exhibit 1 fabric.</p>
CWJZER	<p>Known fibers from the Item 1 piece of fabric and the Item 2 questioned fibers corresponded with respect to color (green/yellow), fiber type (polypropylene), chemical composition (FTIR), microscopic characteristics (PLM), visible spectra (MSP) and fluorescence (Type III Association). Therefore, the questioned fibers could have come from the known chair. It should be noted that the analytical techniques used allow for a high degree of discrimination between different fibers, however, other textiles containing fibers made to the same specifications (type, color, microscopic characteristics, etc.) would be indistinguishable from these fibers. The Item 3 questioned fibers were a different fiber type (polyester) than the Item 1 known fibers (polypropylene). Therefore, Item 1 can be eliminated as a source of the Item 3 fibers. (Elimination). KEY for Instrument Acronyms: PLM – Polarized Light Microscopy. FTIR – Fourier Transform Infrared Microcopy. MSP – Microspectrophotometry. Interpretation: The following descriptions are meant to provide context to the opinions reached in this report. Every type of conclusion may not be applicable in every case or for every material type. Type I Association: Identification: An association in which items share individual characteristics and/or physically fit together that demonstrate the items were once from the same source. Type II Association: Association with distinct characteristics: An association in which items correspond in all measured physical properties, chemical composition and/or microscopic characteristics and share distinctive characteristic(s) that would not be expected to be found in the population of this evidence type. The distinctive characteristics were not sufficient for a Type I Association. Type III Association: Association with conventional characteristics: An association in which items correspond in all measured physical properties, chemical composition and/or microscopic characteristics and could have originated from the same source. Because it is possible for another sample to be indistinguishable from the submitted evidence, an individual source cannot be determined. Type IV Association: Association with limitations: An association in which items could not be differentiated based on observed and/or measured properties and/or chemical composition. As compared to the categories above, this type of association has decreased evidential value as a result of items that are more commonly encountered in the relevant</p>

TABLE 4

WebCode	Conclusions
	<p>population, the inability to perform a complete analysis, limited information, or minor variations observed in the data. Inconclusive: No conclusion could be reached regarding an association or an elimination between the items. Dissimilar: The items were dissimilar in physical properties and/or chemical composition, indicating that the items may not have originated from the same source. However, these dissimilarities were insufficient for a definitive Elimination. Elimination: Items exhibit dissimilarities in one or more of the following: physical properties, chemical composition or microscopic characteristics and, therefore, conclusively did not originate from the same source.</p>
DBC9AW	<p>1. Examination of Exhibit 2 (questioned fibers from suspect's winter gloves) disclosed the presence of olefin fibers. Comparative examinations of a representative sample of the fibers recovered in Exhibit 2 to the fibers composing the fabric in Exhibit 1 (known section of the victim's chair) disclosed them to be consistent in their microscopic, optical, and chemical properties. Therefore, these recovered fibers could have had a common source of origin as represented by the fabric sample in Exhibit 1. 2. Exhibit 3 (questioned fibers from suspect's pocket knife) disclosed the presence of polyester fibers. Comparative examinations of a representative sample of the fibers recovered in Exhibit 3 to the fibers composing the fabric in Exhibit 1 disclosed them to be inconsistent in their fiber type. Therefore, these recovered fibers could not have had a common source of origin as represented by the fabric sample in Exhibit 1. 3. Techniques utilized in this examination include stereomicroscopy, polarized light microscopy, comparative microscopy, and microspectrophotometry. 4. A fiber association is not a means of positive identification and the number of possible sources for a specific fiber is unknown; however, due to the variability in manufacturing, dyeing, and consumer use, one would not expect to encounter a suitable fiber selected at random to be consistent with a particular source.</p>
DNKRAD	<p>Item 2 (suspect's winter gloves) have originated from the victim's chair (Item 1).</p>
DPWLR	<p>Fibers recovered from Item 2, questioned fibers "from the suspect's winter gloves," were examined and compared visually and microscopically to fibers composing Item 1, known section of the victim's chair, and were found to be consistent in appearance, generic fiber type, and microscopic characteristics. Therefore, the fibers recovered from item 2 could have come from Item 1. Fibers recovered from Item 3, questioned fibers "from the suspect's pocket knife," were examined and compared to fibers composing Item 1 and were found to be different in appearance, generic fiber type, and microscopic characteristics. Therefore, the fibers recovered from Item 3 did not come from Item 1.</p>
E4UMXR	<p>Item 2, the questioned fibers from the suspect's winter gloves, could have originated from Item 1, the known section of the victim's chair. Item 3, the questioned fibers from the suspect's pocket knife, could not have originated from Item 1.</p>
E6QDBE	<p>Item One, described as a "Known section of the victim's chair," comprises a 4.8 cm² (approx.) swatch of a light green plain weave fabric. No selvage is present. Yarns in both directions (1) and (2) are single ply, spun from Olefin fiber in filament form. Fiber species identified by Fourier Transform Infrared (FT IR) spectroscopy. Item Two, described as "Questioned fibers from the suspect's winter gloves," comprises short specimens of light green fibers. Fiber species identified as Olefin (by FT IR). Item Three, described as "Questioned fibers from the suspect's pocket knife," comprises short specimens of light green fibers. Fiber species identified as Polyester (by FT IR). Based upon the identification of fiber type for all three items under consideration, it is concluded that the Olefin fibers from Item Two could have originated from the victim's chair (upholstery fabric). The Polyester fibers from Item Three, however, could not have originated from the victim's chair.</p>
EZDXEV	<p>The fibres from the victim's chair (item 1) were compared to the fibres from the suspect's gloves (item 2) and the suspect's pocket knife (item 3). The fibres were compared using microscopy, fluorescence, chemically using Fourier transform infrared spectroscopy, and by objectively comparing the colour and UV properties of the fibres using microspectrophotometry. The fibres from the suspect's gloves (item 2) could not be excluded as coming from the victim's chair based on the above techniques. Therefore, the fibres on the suspect's gloves could have come from the victim's chair, or from another source of this</p>

TABLE 4

WebCode	Conclusions
	type of fibre. The fibres from the suspect's pocket knife (item 3) were a different fibre type to the fibres from the victim's chair. Therefore in my opinion, the fibres on the suspect's pocket knife could not have come from the area sampled from the victim's chair.
EZEEMMY	Items 1 and 2 are composed of light green olefin fibers. Item 3 is composed of olive green polyester fibers. One fiber from item 1 was compared to one fiber from item 2 and to two fibers from item 3. The light green olefin fiber from item 2 is similar in microscopic characteristics to the light green olefin fiber from item 1. Additionally, the item 2 fiber has a similar cross section and FTIR spectrum to the item 1 fiber. Therefore, the item 2 fiber could have originated from item 1 or any other textiles containing fibers with the same class characteristics. The olive green polyester fibers from item 3 are dissimilar in microscopic characteristics to the light green olefin fiber of item 1; therefore, item 3 could not have originated from item 1.
F7XAVA	Item 1 is fabric comprised of olefin fibers. These fibers were used for comparison. Item 2 consists of olefin fibers which are similar to the fibers that compose Item 1. These fibers could have originated from Item 1 or from another item comprised of fibers that exhibit the same microscopic characteristics and optical properties." Item 3 consists of 2 types of polyester fibers which are dissimilar to the fibers that compose Item 1. These fibers did not originate from Item 1.
F9LJ8V	Results of Examination: Yellow olefin fibers found in Item 2 exhibit the same microscopic characteristics and optical properties as the yellow olefin fibers comprising Item 1; accordingly, the Item 2 fibers are consistent with originating from Item 1 or from another textile comprised of fibers which exhibit the same microscopic characteristics and optical properties. The fibers in Item 3 are microscopically dissimilar to the fibers comprising Item 1; accordingly, the Item 3 fibers are inconsistent with originating from the same source as Item 1. No other fiber examinations have been conducted on the submitted items. The submitted items were examined using stereomicroscopy, comparison microscopy, polarized light microscopy, fluorescence microscopy, microspectrophotometry, and Fourier Transform-Infrared Spectroscopy, where appropriate.
FBQELR	Fibers from "item 2" suspect's winter gloves could have originated from "item 1" victim's chair. Fibers from "item 3" pocket knife could NOT have originated from "item 1", they are different.
FK2EMV	Light green olefin fibers recovered from Item 2 exhibit the same microscopic characteristics and optical properties as the light green olefin fibers comprising Item 1. Accordingly, these fibers are consistent with originating from Item 1, or another item comprised of fibers that exhibit the same microscopic characteristics and optical properties. It should be noted, the light green olefin fibers from both Items 1 and 2 appear yellow under transmitted light. The fibers recovered from Item 3 are microscopically dissimilar to the light green olefin fibers comprising Item 1. Accordingly, these fibers are not consistent with originating from the source of Item 1.
FKCF79	Fibers Q1 (Item 2) are physically and optically consistent with Fibers K1 (Item 1) with no discriminating differences. Q1.1 (subset of Q1) is chemically consistent with K1.1 (subset of K1) with no discriminating differences. Q2 and Q3 (Item 3) are physically and optically different from K1. Fiber Q1.1 could have originated from the source (Item 1) represented by fiber K1.1 or from another source exhibiting all of the same analyzed characteristics. No conclusions are reached about the remaining Q1 or K1 fibers. Fibers Q2 and Q3 could not have originated from the source (Item 1) represented by fibers K1. Because textile fibers are mass produced, it is not possible to state that a fiber originated from a particular textile source to the exclusion of all other materials composed of fibers which exhibit the same physical, optical, and chemical properties.
FPUFNA	Item 2 is consistent with Item 1. Item 3 is not consistent with Items 1 and 2.
FQ6KXR	Examination of Item 1 revealed the presence of a swatch of yellow-green woven fabric comprised of polypropylene fibers. Examination of Item 2 revealed the presence of a clump of yellow-green

TABLE 4

WebCode	Conclusions
	polypropylene fibers. These fibers in Item 2 were found to be consistent with the fibers in Item 1. Therefore, Item 2 could have originated from the same source as Item 1. Examination of Item 3 revealed the presence of a clump of two types of lime-green polyester fibers. These fibers are not consistent with the fibers from Item 1. Therefore, Item 3 could not have originated from the same source as Item 1.
FU7YUC	The fibers of Item1 are analyzed to have the same thickness, the interference color of polarizing light, cross sectional shape, and component for those of Item2. The fibers of Item1 have different thickness, the interference color of polarizing light, and component (Item1 fibers: polypropylene, Item3 fibers: polyester) for those of Item3. Thus, the fibers of Item1 are estimated to be the same kind of fibers as those of Item2, but different from those of Item3. So, the fibers prepared from the suspect's winter gloves(Item2) have originated fromthe victim's chair(Item1)
FW7YJT	The results of the examination support that the questioned fibres from the suspect's winter gloves (Item 2) originate from the victim's chair (Item 1). The results of the examination extremely strongly support that the questioned fibres from the suspect's pocket knife (Item 3) do not originate from the victim's chair (Item 1).
GQHCHNM	Examination of Lab Item # 2 (Questioned fibers from the suspect's winter gloves) revealed the presence of a clump of yellow polypropylene fibers. These fibers were found to be consistent with the yellow polypropylene fibers that comprised the fabric in Lab Item # 1 (Known section of the victim's chair). Therefore, the yellow polypropylene fibers in Lab Item # 2 could have originated from the same source as the yellow polypropylene fibers from the fabric in Lab Item # 1. Examination of Lab Item # 3 (Questioned fibers from the suspect's pocket knife) revealed the presence of a clump of green fibers comprised of two green polyester fiber types found to be not consistent with the yellow polypropylene fibers from the fabric in Lab Item # 1. Therefore, the two green polyester fiber types in Lab Item # 3 could not have originated from the same source as the yellow polypropylene fibers from the fabric in Lab Item # 1.
GRW969	1. The sample received as the "Known section of the victim's chair" (item 1) is made by green polypropylene fibers. 2. The sample received as the "Questioned fibers from the suspect's winter gloves" (item 2) is made by green polypropylene fibers. 3. The sample received as "Questioned fibers from the suspect's pocket knife" (item 3)is composed by green polyester fibers. 4. According with the physical,chemical -properties evaluated, the questioned fibers received as item 2 are indistinguishable from the sample received as item 1.
H2EW8R	The fibers from item #1-2 corresponded in size, type (polypropylene), color, microscopic appearance, and infrared spectrum to known fibers from item #1-1. The fibers from item #1-3 did not corresponded in size, type (polypropylene), color, microscopic appearance, and infrared spectrum to known fibers from item #1-1.
H462ZX	The questioned fibers from the gloves (Item 2) could have originated from the chair (Item 1), as represented by the submitted exemplar of the chair fabric, or from another textile source with fibers exhibiting all of the same analyzed characteristics. The questioned fibers from the knife (item 3) could not have originated from the chair (Item 1), as represented by the submitted exemplar of the chair fabric.
H6T4F7	Results, Interpretation and conclusion: Fibres recovered from the Suspect's Winter Gloves (Item 2) matched the control fibres taken from the victim's chair (Item 1). Fibres recovered from the Suspect's pocket Knife (Item 3) do not match the control fibres taken from the victim's chair (Item 1). In reaching my conclusions, I have considered the following alternative propositions to explain the scientific findings in this case: a)The Suspect's winter gloves (Item 2) and the victim's chair (Item 1) have been in contact with each other, b)The Suspect's winter gloves (Item 2) have been in contact with fibres of identical colour and composition to that of the Victim's chair (Item 1), and any fibres recovered are due to a chance match. Two clumps of fibres composed of a significant number of fibres (in excess of 50 fibres)

TABLE 4

WebCode	Conclusions
	<p>were found on the gloves which were visually similar to the chair. A sample of these recovered fibres were found to be indistinguishable in terms of colour and chemical composition to the green polypropylene (Polyolefin) fibres of the chair relating to the victim. Consequently in my opinion, there is very strong support for the view that the Suspect's Winter gloves have been in contact with the victim's chair rather than the fibres transferred originating from another identical item.</p>
HMEVUQ	<p>Item 1 was found to consist of microscopically yellowish-green polypropylene (olefin) fibres. Based on microscopic characteristics, fluorescence, instrumental colour analysis, and chemical composition, the microscopically yellowish-green polypropylene (olefin) fibres sampled from Item 2 could have originated from Item 1, or other sources containing fibres with similar characteristics. Based on microscopic characteristics and chemical composition, two types of microscopically yellowish-green polyester fibres sampled from Item 3 were found to be different from the microscopically yellowish-green polypropylene (olefin) fibres constituting Item 1.</p>
HUT4VR	<p>The results of trace evidence (fiber) examinations are included in this report. Methods: Microscopic examination of fibers is accomplished by using one or more analytical techniques including stereomicroscopy, comparison microscopy, polarized light microscopy, fluorescence microscopy, and instrumentally using microspectrophotometry and Fourier transform-infrared spectroscopy. The microscopic characteristics and optical properties determined by these techniques are used for the examination and comparison of fibers. Results of Examinations: Green-yellow olefin fibers recovered from Item 2 exhibit the same microscopic characteristics and optical properties as the fibers comprising Item 1. Accordingly, these fibers are consistent with originating from Item 1, or another item comprised of fibers that exhibit the same microscopic characteristics and optical properties. Fibers recovered from Item 3 are microscopically dissimilar to the fibers comprising Item 1. Accordingly, these fibers are not consistent with originating from Item 1. No other fibers were recovered from Items 2 and 3. The specimens were examined using the following techniques as appropriate: stereomicroscopy, comparison microscopy, polarized light microscopy, fluorescence microscopy, microspectrophotometry and Fourier transform-infrared spectroscopy. Interpretation: Fibers can differ as to type (e.g. rayon, cotton), color, shape, size, microscopic features (e.g. delusterant, voids) and optical properties (e.g. refractive index, sign of elongation). These are characteristics that may associate fibers with a group of items, but never to a single item to the exclusion of all others. However, even fibers with many similar properties may be excluded as originating from the same source by using the identified analytical methods. The characteristics and optical properties present in fiber(s) are used as comparison criteria. When the characteristics and optical properties of a recovered fiber(s) are the same as a known sample, the recovered fibers are consistent with originating from the source of the known sample, or from another item comprised of fibers that exhibit the same microscopic characteristics and optical properties. A fiber association is not a means of positive identification and the number of possible sources for a specific fiber is unknown. However, due to the variability in manufacturing, dyeing, and consumer use, one would not expect to encounter a fiber selected at random to be consistent with a particular source. The inability to associate persons/items through a microscopic fiber examination does not necessarily mean the persons/items of interest had no contact. A number of factors can produce this result, including: 1) Fiber evidence may not have transferred. 2) Fibers that did transfer may have been lost prior to submission to the laboratory. 3) The fibers transferred or the known comparison specimen submitted may not be representative of the source. 4) The fibers may be from a different source.</p>
J2B4X6	<p>Item 1 consists of long, pale yellow/green manufactured fibres. Item 2 consists of long, pale yellow/green manufactured fibres that appear visually similar when viewed under stereomicroscope to the constituent fibres of item 1. Item 3 consists of long, pale green manufactured fibres. These fibres appear different when viewed under the stereomicroscope to the constituent fibres of item 1.</p>
JALVE8	<p>The fibers in item 1 were similar to the fibers in item 2, but the fibers in item 1 were different from the fibers in item 3. Item 1 and 2 consisted of manufactured olefin fibers, but item 3 consisted of manufactured polyester fibers.</p>
JAPF6V	<p>Items 1 and 2 exhibit similar properties in microscopy (PLM), FTIR, MSP, and comparison microscopy.</p>

TABLE 4

WebCode	Conclusions
	Item 1 could be a source of the fibers in item 2. Item 1 and 3 do not share any similarities in the above mentioned examinations. Item 1 is not a source of the fibers in item 3.
JEEXGL	The olefin fibers identified in Exhibit 2 have the same physical, optical and chemical properties as the olefin fibers from the chair in Exhibit 1. The fibers in Exhibit 2 could have originated from Exhibit 1 or from any other material consisting of olefin fibers with the same physical characteristics and chemical composition. The fibers in Exhibit 3 were identified as polyester. The fibers in Exhibit 3 could not have originated from Exhibit 1.
JTZDJL	The green polyolefin fibers recovered from the gloves (Item 2) were determined to be physically, microscopically and chemically (Comparison Microscopy and Fourier Transform Infrared Spectroscopy) consistent with the green polyolefin fibers from the victim's chair (Item 1) and therefore may have once had a common origin. The green fibers from the pocket knife (Item 3) are physically, microscopically and chemically dissimilar to the green fibers recovered from the victim's chair (Item 1) and therefore could not have had a common origin.
JXQPJN	A comparison of the fibers from the suspect's gloves (exhibit 2) and pocket knife (exhibit 3) to the fabric swatch collected from the victim's chair (exhibit 1) was performed using microscopic and instrumental methods. The examined fibers in exhibits 1 and 2 were identified as polypropylene. The examined fibers in exhibit 3 were identified as polyester. The yellow-green fibers from the suspect's gloves were similar to the fabric swatch collected from the victim's chair. Therefore, the exhibit 2 fibers could have originated from the victim's chair (exhibit 1) or another source having similar fibers. The fibers from the suspect's pocket knife were dissimilar to the fabric swatch from the victim's chair (exhibit 1).
L7XY4L	Item 1 was found to consist of microscopically light greenish-yellow polypropylene (olefin) fibres. Based on microscopic characteristics, fluorescence, instrumental colour analysis and chemical composition, the microscopically light greenish-yellow polypropylene (olefin) fibres sampled from Item 2 could have originated from Item 1, or other sources containing fibres with similar characteristics. Based on microscopic characteristics and chemical composition, two types of microscopically light greenish-yellow polyester fibres sampled from Item 3 were found to be different from the microscopically light greenish-yellow polypropylene (olefin) fibres constituting Item 1.
L896ZM	On the basis of microscopic examination, the fibres from Item 3 could be differentiated from Item 1. Therefore the fibres recovered from the suspect's pocket knife (Item 3), could not have come from the known section of the victim's chair (Item 1). On the basis of microscopic, colour and chemical analysis, the fibres from Item 2 could not be differentiated from Item 1. Therefore the fibres recovered from the suspect's winter gloves (Item 2) could have come from the known section of the victim's chair (Item 1) or any other textile with comparable properties.
L9Z4EL	The green polypropylene fibers in item 2 were visually, microscopically, and instrumentally consistent with the green polypropylene fibers from the fabric in item 1. This indicates that the fibers in item 2 could have originated from the fabric in item 1. The green polyester fibers in item 3 were microscopically and instrumentally inconsistent with the green polypropylene fibers from the fabric in item 1. This indicates that the fibers in item 3 did not originate from the fabric in item 1.
LGUCWR	The questioned fibers from the suspect's winter gloves (Item 2) and the questioned fibers from the suspect's pocket knife (Item 3) were microscopically examined and compared to Item 1 (the fibers comprising the known sample from the victim's chair.) These examinations revealed that the questioned fibers from the suspect's winter gloves (Item 2) were consistent in appearance, fiber type and microscopic characteristics to the fibers comprising the known sample from the victim's chair, and therefore, could have originated from that source. Examinations also revealed that the questioned fibers from the suspect's pocket knife (Item 3) were dissimilar to the fibers comprising the known sample from the victim's chair, and therefore, did not originate from that source. Because textile materials are mass produced, it is not possible to state that a fiber originated from a particular source to the exclusion of all other textile materials composed of fibers which exhibit the same physical, optical, and/or chemical

TABLE 4

WebCode	Conclusions
	properties.
LH8B63	Item (2) could have originated from item (1). Item (3) could not have originated from item (1).
LKYUZT	No discriminating differences were observed between the questioned fibers observed in item 2 and the submitted exemplar (item 1). Item 2 could have originated from Item 1 as represented by the known submitted exemplar or from another source exhibiting all of the same analyzed/measured characteristics. Based on microscopic and instrumental comparisons to the submitted exemplar (item 1), the fibers observed in item 3 could not have originated from the source represented by item 1.
LWRQ92	The fabric from Item #1 consisted of light green olefin fibers. The questioned fibers from Item #2 also consisted of olefin fibers. These fibers were consistent in color, diameter, chemical composition and microscopic characteristics with the fibers from Item #1 and could have originated from the same source (Level III association). The questioned fibers from Item #3 consisted of two types of polyester fibers. These fibers were inconsistent in diameter and chemical composition with the known fibers from Item #1 and did not originate from this source (elimination). Terminology Key for Associative Evidence: The following descriptions are meant to provide context to the levels of opinions reached in this report. Every level of conclusion may not be applicable in every case nor for every material type. Level I Association: A physical match; items physically fit back to one another, indicating that the items were once from the same source. Level II Association: An association in which items are consistent in observed and measured physical properties and/or chemical composition and share atypical characteristic(s) that would not be expected to be readily available in the population of this evidence type. Level III Association: An association in which items are consistent in observed and measured physical properties and/or chemical composition and, therefore, could have originated from the same source. Because other items have been manufactured that would also be indistinguishable from the submitted evidence, an individual source cannot be determined. Level IV Association: An association in which items are consistent in observed and measured physical properties and/or chemical composition and, therefore, could have originated from the same source. As compared to a Level III association, items categorized within a Level IV share characteristics that are more common amongst these kinds of manufactured products. Alternatively, an association between items would be categorized as a Level IV if a limited analysis was performed due to characteristics or size of the specimen(s). Level V Association: An association in which items are consistent in some, but not all, physical properties and/or chemical composition. Some minor variation(s) exists between the known and questioned items and could be due to factors such as sample heterogeneity, contamination of the sample(s), or having a sample of insufficient size to adequately assess homogeneity of the entity from which it was derived. Inconclusive: No conclusion could be reached regarding an association/elimination between the items. Elimination: The items were dissimilar in physical properties and/or chemical composition, indicating that they did not originate from the same source.
MXZTMQ	The clump of green fibres from the suspect's gloves, (item 2), matched the control fibres of the torn fabric of the chair, (item 1). This provides very strong support for the view that the fibres from the suspect's glove came from the chair in the complainant's house rather than they came from some other source of fibres. Note: The fibres found were made of polypropylene. This is an unusual type of fibre and rarely encountered in textiles in this lab. The clump of green fibres on the suspect's knife, (item 3), did not match the fibres of the torn chair, (item 1) and so they came from other source of fibres.
NEZMMH	We have considered the following two alternative explanations for the presence of the olefin fibres recovered from the suspect's gloves: the olefin fibres recovered from the suspect's gloves originate from the victim's chair. The olefin fibres recovered from the suspect's gloves did not come from the victim's chair and came from some other item(s); they therefore match the component fibres of the victim's chair by chance. In our opinion, our findings provide very strong support for the first assertion, rather than the second assertion.
NMDDTM	1. Exhibit 1 (known section of the victim's chair) consists of a section of fabric containing numerous

TABLE 4

WebCode	Conclusions
	<p>yarns that are composed of polypropylene fibers. 2. Comparative examinations of a representative sample of the polypropylene fibers recovered in Exhibit 2 (questioned fibers from the suspect's winter gloves) to the polypropylene fibers that compose the fabric in Exhibit 1 disclosed them to be consistent in their microscopic characteristics, optical properties, and chemical properties. Therefore, these recovered fibers could have originated from the fabric in Exhibit 1. 3. Comparative examinations of a representative sample of the polyester fibers recovered in Exhibit 3 (questioned fibers from the suspect's pocket knife) to the polypropylene fibers that compose the fabric in Exhibit 1 disclosed them to be inconsistent in their microscopic characteristics, optical properties, and chemical properties. Therefore, these recovered fibers could not have originated from the fabric in Exhibit 1. 4. Techniques utilized in this examination include stereo microscopy, polarized light microscopy, comparative microscopy, microspectrophotometry, and Fourier transform infrared spectroscopy. It should be noted that a fiber association is not a means of positive identification and the number of possible sources for a specific fiber is unknown. Due to the variability in manufacturing, dyeing, and consumer use, one would not expect to encounter a suitable fiber selected at random to be consistent with a particular source.</p>
NPZTL3	<p>Sample 1 is a yellow-green cylindrical polypropylene fiber ranging from 20 μm to 30 μm in diameter. Sample 2 is also a yellow-green cylindrical polypropylene fiber which exhibits minor but notable differences in pigment distribution and apparent fiber diameter (which ranges from 25 μm to 40 μm). These differences can be explained by localized manufacturing defects and deformation due to handling, respectively. The similarities in fiber and pigment composition (as observed in IR and Raman) and the similarities in fiber diameter and shape observed in unperturbed lengths of the fiber (as observed in SEM and PLM) suggest that Sample 1 is a possible source for Sample 2, despite the differences noted above. Sample 3 is a yellow-green twisted prismatic polyethylene terephthalate (PET) fiber approximately 12 μm to 13 μm in diameter. Sample 1 cannot have been the source for Sample 3.</p>
NXVME	<p>The questioned fibers in Item 2 (from the suspect's winter gloves) corresponded in microscopic characteristics (PLM), cross-section (round/oval), color (pale green), type (polypropylene), fluorescence, visible spectra (MSP) and chemical composition (FTIR) to the known fibers in Item 1 (from the victim's chair). Therefore, Items 1 and 2 could have a common source (Type 3 Association). It should be noted that the analytical techniques used allow for a high degree of discrimination between different fibers, however, other textiles containing fibers made to the same specifications (type, color, microscopic characteristics, etc.) would be indistinguishable from these fibers. The questioned fibers in Item 3 (from the suspect's pocket) were a different type (polyester) than the known fibers from Item 1 (polypropylene). Therefore, Item 1 can be eliminated as being the source of the Item 3 fibers (Elimination). KEY for instrument acronyms: FTIR – Fourier Transform Infrared Spectroscopy. PLM – Polarized Light Microscopy. MSP – Microspectrophotometry</p>
NZKPHG	<p>The fiber in Item 1 was similar to Item 2 and different from item 3. Item 1 and 2 consisted of manufactured Olefin fiber and Item 2 consisted of manufactured Polyester.</p>
P4EF7K	<p>Based upon the observations made and the analyses conducted, It is my opinion there is a Level 3 association between the fibres of Item 1 and Item 2. Level 3 items are consistent in observed and measured physical properties and/or chemical composition and, therefore, could have originated from the same source. Because other items have been manufactured that would also be indistinguishable from the submitted evidence, and individual source cannot be determined. Item 1 is eliminated as a source for Item 3. "Levels of association" range from "1" (highest) to "5"(lowest), plus "inconclusive" and "elimination".</p>
PTW23H	<p>1. The green polypropylene fibres collected from the suspect's winter gloves (item #2) cannot be excluded as having originated from the complainant's chair (item #1), therefore they either originated from the complainant's chair (item #1) or from another item or items with indistinguishable fibres. 2. The green polyester fibres collected from the suspect's pocket knife (item #3) did not originate from the complainant's chair (item #1).</p>
PZDCGJ	<p>I was unable to distinguish between the fibres comprising each of items 1 (known section of fabric from</p>

TABLE 4

WebCode	Conclusions
	<p>the victim's chair) and 2 (questioned fibres from the suspects's winter gloves) on the basis of their colour (lime green), fibre composition (polypropylene), fibre diameters, fibre morphologies, optical properties and fluorescence properties. I am therefore of the opinion that, on the basis of the examinations and testing conducted, the known section of fabric from the victim's chair (item 1), or a similar piece of fabric from the same manufacturer, could be the source of the questioned fibres from the suspect's winter gloves (item 2). I was able to exclude item 1 (known section of fabric from the victim's chair) as being a source of the fibres from item 3 (questioned fibres from the suspect's pocket knife) on the basis of their fibre types (item 1 being composed of polypropylene fibres and items 3 being composed of polyester fibres). I am therefore of the opinion that, on the basis of the examinations and testing conducted, the known section of fabric from the victim's chair (item 1) could not be a source of the questioned fibres from the suspect's pocket knife (item 3).</p>
Q3EZBY	[No Conclusions Reported.]
Q4UW3Y	<p>Within a reasonable degree of scientific certainty and based on education, training and experience, the laboratory holds the following opinions: The fibers in Item 2 match those in Item 1 and both have been identified as polypropylene with a diameter of 25 to 27 microns and may share a common origin. The fibers in Item 3 have been identified as polyester and do not match those of Item 1.</p>
QEF3XH	<p>Item 1: A light green (yellow/green) olefin fiber standard was analyzed for comparison to items 2 and 3. Item 2: Numerous unknown yellow/green olefin fibers were found. The unknown olefin fibers "from the suspect's winter gloves" either originated from the olefin fiber standard from "the victim's chair" (item 1) or another source of fibers possessing the same distinct physical, chemical, and optical characteristics. Item 3: Numerous unknown yellow/green polyester fibers were found. The unknown polyester fibers "from the suspect's pocket knife" and the olefin fiber standard from "the victim's chair" (item 1) are not the same in physical, chemical, or optical characteristics. The unknown fibers "from the suspect's pocket knife" could not have originated from the standard.</p>
QGG7MJ	<p>Item 1, the known section of the victim's chair comprised green olefin fibres. Item 2, the questioned fibres from the suspect's winter gloves comprised green olefin fibres, agreeing in colour, fibre type and microscopic appearance under various conditions with the control green olefin fibres from Item 1, indicating that they could have originated from the same source. Item 3, the questioned fibres from the suspect's pocket knife differed in fibre type, microscopic appearance under various conditions with control fibres from Item 1, indicating that they did not originate from the same source.</p>
QGLNPN	<p>Numerous fibers were recovered from the questioned fibers from the suspect's winter gloves (Item 2). A portion of these fibers was further examined and found to be similar in color, size, shape, optical properties, and fiber type to the known fibers from the victim's chair (Item 1). It is my opinion these fibers collected from the suspect's winter gloves could have originated from the victim's chair or any other item with similar fiber characteristics (Category 2B). No analysis was done on the remaining fibers. Numerous fibers were recovered from the questioned fibers from the suspect's pocket knife (Item 3). A portion of these fibers was further examined and found to be different in visual color, size, shape, optical properties, and fiber type to the known fibers from the victim's chair (Item 1). It is my opinion these questioned fibers collected from the suspect's pocket knife did not originate from the victim's chair (Category 5). No analysis was done on the remaining fibers.</p>
QGYFEY	<p>The fibers in item1 were similar to the fibers in item2. But the fibers in item1 were different from the fibers in item3. Item1 and item2 consisted of manufactured olefin fibers, but item3 consisted of manufactured polyester.</p>
QRF3MZ	<p>This sample consists of three item numbers. Item 1 is a piece of green colored, plain weave fabric with each directional yarn made of multi-filaments composed of polypropylene. Item 2 is a little bunch of green colored filaments composed of polypropylene. Item 3 is a bunch of green colored filaments composed of polyester. Based on lab results, Item 2 could have originated from Item 1.</p>

TABLE 4

WebCode	Conclusions
QUAMGQ	The item 2 questioned fibers from the suspect's winter gloves correspond to the item 1 (known fibers from the victim's chair) in color, size, microscopic characteristics (compound and PLM microscopes), and fiber type (olefin). Therefore, the known sample from the chair could be the source of the fibers found on the item 2 (gloves). The item 3 fibers (from the pocket knife) do not correspond to the known sample from the chair in size, microscopic characteristics or fiber type. Therefore, the fibers from the pocket knife did not originate from the chair.
QUNCHH	Questioned fibers from the suspect's winter gloves (ITEM 2) could have originated from the victim's chair upholstery (ITEM 1). No differences in the type, chemical composition, morphology and color were found between fibers from ITEM 1 and ITEM 2. Questioned fibers from the suspect's pocket knife (ITEM 3) could not have originated from the victim's chair upholstery (ITEM 1). The fibers from ITEM 1 and ITEM 3 are different in the type, chemical composition and morphology.
QWEFBP	Questioned green fibers recovered from gloves (Item 2) and questioned green fibers recovered from a pocket knife (Item 3) were compared to known green fibers from a chair (Item 1) using microscopy, fluorescence, infrared spectroscopy, and microspectrophotometry. The questioned fibers within Item 2 were similar in all tests performed to the known fibers within Item 1. The chair is a possible source of the questioned fibers recovered from the gloves. Because similar fibers have been manufactured that would be indistinguishable from the submitted evidence, an individual source cannot be determined. The questioned fibers within Item 3 differed from the known fibers within Item 1 in microscopical properties, fluorescence, chemistry, and color. The questioned fibers recovered from the pocket knife did not originate from the chair, as represented by Item 1.
QWU3ZD	Yellow green olefin fibres found on the suspect's gloves (Item 2) were indistinguishable from those making up the victim's chair (Item 1). I have considered the following alternative explanations for this finding: either the fibres match coincidentally or they match because they originate from the same source. In my opinion these findings provide at least moderately strong support for the assertion that fibres recovered from the suspect's gloves originated from the victim's damaged chair, rather than being due to a chance match. The fibres recovered from the suspect's pocket knife (Item 3) do not appear to have originated from the victim's chair.
QX7CXX	The green olefin fibers, (item 2), are consistent in color, physical characteristics and chemical composition as compared to the green olefin reference fibers collected from the victim's chair, (item 1). Level III association. The green polyester fibers, (item 3), display differences in physical characteristics and chemical composition as compared to the green olefin reference fibers collected from the victim's chair, (item 1). Elimination.
R7YGDY	The light green olefin fibers collected from the suspect's winter gloves, (item 2) are consistent with the light green olefin fibers, the reference fibers from the known section of the victim's chair (item 1). The light green polyester fibers collected from the suspect's pocket knife, (item 3) are not consistent with the light green olefin fibers, the reference fibers from the known section of the victim's chair (item 1). A conclusion of "consistent" indicates that the analyzed sample possesses identical physical, chemical, and/or optical characteristics as those detected within a comparison sample. However, the analyzed sample lacks sufficient individualizing characteristics to identify a unique source. A conclusion of "not consistent" indicates that the physical, chemical, and/or optical characteristics of the analyzed sample are different from those of the comparison sample or from a unique source.
REABGL	CONCLUSIONS: Questioned fibers identified as from the suspect's gloves (CTS Item 2) originated from the victim's chair (CTS Item 1) or another source of textile material possessing fibers with the same distinct microscopic, optical, and chemical characteristics. RESULTS: The questioned fibers identified as from the suspect's gloves (CTS Item 2) and pocket knife (CTS Item 3) were examined to determine whether or not there are any fibers present that are consistent with the victim's chair (CTS Item 1). The victim's chair (CTS Item 1) is primarily composed of light yellow-green olefin fibers. The questioned fibers identified as from the suspect's gloves (CTS Item 2) are primarily composed of light yellow-green olefin fibers. The questioned fibers identified as from the suspect's pocket knife (CTS Item 3) are

TABLE 4

WebCode	Conclusions
	<p>primarily composed of two different light green-yellow polyester fibers. Examination and comparison of questioned fibers identified as from the suspect's gloves (CTS Item 2) reveals the presence of numerous fibers that are consistent in microscopic, optical, and chemical characteristics with the known fibers of the victim's chair (CTS Item 1). It is therefore concluded the questioned fibers originated from the victim's chair or another source of textile material possessing fibers with the same distinct microscopic, optical, and chemical characteristics. Examination and comparison of questioned fibers identified as from the suspect's pocket knife (CTS Item 3) with known fibers of the victim's chair (CTS Item 1) reveals they are inconsistent in microscopic and/or optical characteristics. It is therefore concluded the questioned fibers did not originate from the victim's chair. METHODS OF ANALYSIS: Examinations were performed visually, by stereo microscopy, brightfield/polarized light comparison microscopy, fluorescence microscopy, microspectrophotometry and Fourier transform infrared microspectroscopy.</p>
RKF3PH	<p>Yellow olefin fibers found in Item 2 exhibit the same microscopic characteristics and optical properties as the yellow olefin fibers comprising Item 1. Accordingly, these fibers are consistent with originating from Item 1 or another item comprised of fibers that exhibit the same microscopic characteristics and optical properties. Fibers recovered from Item 3 are microscopically dissimilar to the fibers comprising Item 1. Accordingly, these fibers are not consistent with originating from Item 1. The specimens were examined using stereomicroscopy, comparison microscopy, polarized light microscopy, fluorescence microscopy, microspectrophotometry and infrared spectroscopy, where appropriate.</p>
T6EPQD	<p>The known section of the victim's chair (Ex 01-01/Item 1) consists of yellowish-green olefin fibers which were used for comparison purposes. Three of the questioned fibers from the suspect's winter gloves (Ex 01-02/Item 2) are yellowish-green olefin fibers which are similar in color, size, shape, optical properties, and fiber type to the yellowish-green olefin fibers from the known section of the victim's chair (Ex 01-01/Item 1). It is my opinion that these questioned fibers from the suspect's winter gloves (Ex 01-02/Item 2) could have originated from the victim's chair or any other item with similar fiber characteristics. (Category 2B) The remaining questioned fibers from the suspect's winter gloves (Ex 01-02/Item 2) are visually similar to the fibers from the known section of the victim's chair (Ex 01-01/Item 1). Additional analysis was not performed on these fibers. The questioned green polyester fibers from the suspect's pocket knife (Ex 01-03/Item 3) are dissimilar in visual color, optical properties, and fiber type to the yellowish green olefin fibers from the known section of the victim's chair (Ex 01-01/Item 1). It is my opinion that these questioned fibers from the suspect's pocket knife (Ex 01-03/Item 3) did not originate from the area sampled from the victim's chair (Ex 01-01/Item 1). (Category 5)</p>
TPMRNH	<p>1) Examination of Exhibit 1 (textile material) disclosed the presence of olefin fibers. 2) Examination of Exhibit 2 (questioned fibers) disclosed the presence of loosely tangled olefin fibers. 3) Examination of Exhibit 3 (questioned fibers) disclosed the presence of loosely tangled polyester fibers. 4) Comparative examinations of the olefin fibers in Exhibit 1 to a representative sample of the olefin fibers in Exhibit 2 disclosed them to be consistent in their microscopic characteristics, optical properties, and chemical properties. Therefore, the fibers from Exhibit 2 could have a common source of origin with Exhibit 1. Techniques utilized in this examination include stereo microscopy, polarized light microscopy, comparative microscopy, microspectrophotometry, Fourier transform infrared spectroscopy. 5) A fiber association is not a positive identification and the number of possible sources for a specific fiber is unknown. Due to the variability in manufacturing, dyeing, and consumer use, one would not expect to encounter a suitable fiber selected at random to be consistent with a particular source.</p>
UDRYVL	<p>Items 1, 2, and 3 were examined using stereomicroscopy. Fibers in Item 2 and those composing Item 1 were examined using comparison microscopy, polarized light microscopy (PLM), fluorescence microscopy, Fourier Transform Infrared Spectrophotometry (FTIR), Microspectrophotometry (MSP), microchemical tests, and microsolubility tests. Fibers in Item 3 were examined using PLM, FTIR, and microsolubility tests. The yellow-green polypropylene fibers in Item 2 were consistent with physical, chemical, and optical properties with the yellow-green polypropylene fibers composing the Item 1 fabric. It was concluded that the Item 2 yellow-green polypropylene fibers could have originated from the source represented by Item 1 or another source composed of fibers with the same physical, chemical</p>

TABLE 4

WebCode	Conclusions
	and optical properties. Item 3 contained yellow-green polyester fibers. Based upon the fibers analyzed, the Item 3 fibers could not be associated with the fibers composing Item 1 due to differences in fiber type.
UHJ7FF	Item #2 could have originated from item #1 as represented by the known submitted exemplar or from another source exhibiting all of the same analyzed characteristics. Item #3 could not have originated from the source represented by item #1.
UKNTTJ	The green olefin fibers found from suspect's winter gloves (item 2) are consistent with the green olefin fibers of victim's chair (item 1). Item 2 could be originated from item 1. The green polyester fibers found from suspect's pocket knife (item 3) are not consistent with the green olefin fibers of victim's chair (item 1). Item 3 could not be originated from item 1.
UT2D7B	Based on our investigations on the questioned traces, we are able to distinguish the fibers taken from the suspect's pocket knife (Item #3) from the fibers of the victims chair (Item #1). By contrast, the fibers from the suspect's winter gloves (Item #2) are indistinguishable from the fibers of the victim's chair. In conclusion, the fibers from the suspect's winter gloves (Item #2), may originate from the victim's chair (Item #1).
UXCXV	The questioned fibres recovered from the suspect's winter gloves (Item 2) and the fibres recovered of the victim's chair (Item 1) have the same morphological characteristics and the same chemical composition. Item 3 doesn't match item 1 because they have different morphological characteristics and different chemical composition.
V2B2JA	The green fabric (item 1) was made of green polyolefin fibres. Item 2 consisted of a tuft of green polyolefin fibres indistinguishable microscopically and by instrumental colour analysis from the green polyolefin fibres of the fabric (item 1). Therefore this tuft of fibres (item 2) could have come from the fabric (Item 1). Item 3 consisted of a tuft of green polyester fibres and therefore could not have come from the fabric (Item 1).
V2TKBE	The fibers of Item-1 and Item-2, have the same characteristics. Thus the fibers found on the suspect's winter gloves (item-2) come from the victim's chair(item-1) or from another textile item of indistinguishable fibers. The fibers of Item-3 were inconsistent with item-1 and could not have the same source.
V9QE7R	Examination Results: Item-1 is a piece of green cloth composed of olefin. Item-2 consists of green fibers composed of olefin. Item-3 consists of green fibers composed of polyester. Examination Conclusions: Item-1 and Item-2 are composed of green olefin fibers. Item-3 consists of green fibers composed of polyester. Item-3 does not share a common origin with Item-1. Analysis indicates that Item-1 and Item-2 shared all the class characters observed, therefore Item-2 cannot be excluded from sharing a common provenance with Item-1.
VPGRRU	According to the results of the microscopic exams, FTIR, Py-GC/MS and SEM/EDS, the component of Item 2 is similar to those of Item 1. The Item 3 component is dissimilar to Item 1.
WHV749	Based on the birefringence of the fibres observed, Items 1 and 2 displayed similar birefringence properties as nylon, while Item 3 displayed similar properties as polyester. It can therefore be concluded that Item 2 could have originated from Item 1 i.e. the fibers observed on the suspect's winter gloves could have originated from the victim's chair. Item 3 however, the fibers from the suspect's pocket knife did not originate from the victim's chair.
WLD4GH	The questioned fibers in item 2 could have originated from the same source as item 1 or from another source of fibers with the same characteristics. The fibers in item 3 did not originate from the same source as item 1 as represented by the submitted fabric sample in item 1.
WM63QA	The green olefin fibers from the suspect's gloves (Item 2) are similar in color, polymer type and

TABLE 4

WebCode	Conclusions
	microscopic characteristics to the known green olefin fibers from the victim's chair (Item 1). It is my opinion that that these green olefin fibers from the suspect's gloves could have come from the victim's chair or any other source with similar characteristics. The green polyester fibers from the suspect's knife (Item 3) are dissimilar in color and polymer type to the known green olefin fibers from the victim's chair. It is my opinion that these green polyester fibers did not come from the sampled area of the victim's chair.
WM9JTE	Exhibit 2, questioned fibers from the suspect's winter gloves, was examined and compared visually and microscopically to fibers composing Exhibit 1, known section of the victim's chair, and were found to be consistent in appearance, fiber type and microscopic characteristics. Therefore, Exhibit 2, could have come from Exhibit 1. Exhibit 3, questioned fibers from the suspect's pocket knife, was examined and compared visually and microscopically for the presence of fibers like those composing Exhibit 1. None were found.
WWRZHF	The fibers from Item 2 are similar in color, diameter, delusterant, refractive indices, birefringence, and chemical composition to the known fibers from Item 1. The fibers from Item 1 and 2 could have shared a common source. The fibers from Item 3 are different in color, diameter, delusterant, birefringence, and chemical composition to the known fibers from Item 1.
X2HPHJ	The known fibers (Item 1) identified as having come from the victim's chair were compared to the questioned fibers reportedly recovered from the suspect's winter gloves (Item 2) and the suspect's pocket knife (Item 3). The questioned fibers from the suspect's winter gloves and the known fibers from the victim's chair were similar in all tests performed (polarized light microscopy, fluorescence microscopy, cross-section, and microspectrophotometry). Additionally, infrared spectroscopy showed both the questioned and known fibers to be similar in chemical composition (olefin). The victim's chair is a possible source of the questioned fibers from the suspect's winter gloves (Level 3 - Association; see Association Scale below [No Association Scale submitted]). Because other items have been manufactured that would be indistinguishable from the submitted evidence, an individual source cannot be determined. The questioned fibers from the suspect's pocket knife differed in microscopical properties and fiber type, determined by infrared spectroscopy, from the known fibers from the victim's chair. The victim's chair is excluded as a possible source of the questioned fibers (Elimination).
X94M77	A portion of the light green olefin fibers from the Questioned fibers from the suspect's winter gloves (Item 1-2) was examined microscopically and also analyzed instrumentally and was found to be consistent in color, microscopic appearance, fiber type, and instrumental properties with the examined light green olefin fibers from the piece of green woven fabric from the Known section of the victim's chair (Item 1-1). Accordingly, the examined light green olefin fibers from the suspect's winter gloves could have originated from the examined light green olefin fibers from the known section of the victim's chair or another damaged source with the same characteristics. A portion of the light green polyester fibers from the Questioned fibers from the suspect's pocket knife (Item 1-3) was examined microscopically and also analyzed instrumentally and was found to be different in microscopic appearance and fiber type with the examined light green olefin fibers from the piece of green woven fabric from the Known section of the victim's chair (Item 1-1). Accordingly, the examined light green polyester fibers from the suspect's pocket knife could not have originated from the examined light green olefin fibers from the known section of the victim's chair.
XEPH8B	Items 1-3 were examined visually with white and UV light, microscopically, and instrumentally by Fourier transform infrared spectroscopy (FTIR). The polyester fibers recovered from the suspects pocket knife (Item 3) were not consistent with the polypropylene fabric from the victim's chair (Item 1) in regards to color, diameter and fiber type. Based on the samples submitted and examined, the fibers on the suspects pocket knife could not have originated from the victims chair. The polypropylene fibers removed from the suspect's gloves (item 2) were consistent with the polypropylene fibers from the victim's chair (Item 1) in regards to color, diameter and fiber type. Based on the samples submitted and examined, the fibers on the suspect's gloves could have originated from the victim's chair.

TABLE 4

WebCode	Conclusions
XYD6PC	Item 1 comprised a section of woven yellow fabric. The fibres which comprised the fabric were identified as polypropylene. Item 2 comprised a tuft of yellow fibres. The fibres were found to correspond in appearance, colour and composition to fibres from Item 1. Item 3 comprised a tuft of yellow fibres. The fibres were identified as polyester, and therefore did not correspond to fibres from Item 1. The results support the proposition that fibres from the suspect's gloves (Item 2) originated from the victim's chair (Item 1). The results do not support the proposition that fibres from the suspect's pocket knife (Item 3) originated from the victim's chair (Item 1).
YCFTJR	Results of Fiber Analysis- Microscopic and instrumental examination of the representative fibers from Item 1 revealed light green delusterous olefin fibers. Microscopic and instrumental examination of the representative fibers from Item 2 revealed light green delusterous olefin fibers. Microscopic and instrumental examination of the representative fibers from Item 3 revealed light green delusterous polyester fibers. Results of Fiber Comparison- The representative lime green fibers in Items 1 and 2 were found to be similar in microscopic, optical, chemical, and color properties. They could have come from the same source or any other source with the same properties. The representative lime green fibers from Items 1 and 3 were found to be dissimilar in microscopic, optical and chemical properties. They could not have come from the same source.
YPM22A	The fibre traces from the suspect's winter gloves (Item 2) could have originated from the victim's chair (Item 1)
YQFUWT	The questioned fibers from the suspect's winter gloves (item #2) could have originated from the victim's chair (item #1). The questioned fibers from the suspect's pocket knife (item #3) could not have originated from the victim's chair (item #1).
ZAMGXR	The sample consists of three items: Item 1: Known section of the victim's chair; Item 2: Questioned fibers from the suspect's winter gloves; Item 3: Questioned fibers from the suspect's pocket knife. Item 1 and Item 2 are composed of olefin. Item 3 composed of polyester fibers. Fibers from the suspect's winter gloves (Item 2) could have originated from the victim's chair (Item 1). Fibers from the suspect's pocket knife (Item 3) could not have originated from the victim's chair (Item 1).
ZTYBMC	CONCLUSIONS: Questioned fibers identified as from the gloves (Item 2) originated from the chair (Item 1) or another source of textile material possessing fibers with the same distinct microscopic, optical, and chemical characteristics. Questioned fibers identified as from the knife (Item 3) did not originate from the chair (Item 1). RESULTS: Questioned fibers identified as from the suspect's gloves and knife (Items 2 and 3) were examined to determine whether or not they are consistent with known fibers of the victim's chair (Item 1). The sample of fabric from the victim's chair (Item 1) is primarily composed of olefin fibers. Examination and comparison of questioned fibers identified as from the suspect's gloves (Item 2) with known the known fibers of the victim's chair (Item 1) reveals they are consistent in microscopic, optical, and chemical characteristics. It is therefore concluded the questioned fibers originated from the chair or another source of textile material possessing fibers with the same distinct microscopic, optical, and chemical characteristics. Examination and comparison of questioned fibers identified as from the suspect's knife (Item 3) with the known fibers of the victim's chair (Item 1) reveals they are inconsistent in microscopic characteristics. It is therefore concluded the questioned fibers did not originate from the chair. METHODS OF ANALYSIS: Examinations were performed visually, by stereo microscopy, brightfield/polarized light comparison microscopy, fluorescence microscopy, microspectrophotometry, and Fourier transform infrared microspectroscopy.
ZW64TR	Item 2 fibers could have come from Item 1 or from another source with similar optical, chemical, and physical properties.

Additional Comments

TABLE 5

WebCode	Additional Comments
2J88YA	A brown cotton fiber is discovered in item 2. It can be a contamination, or can come from the suspect's winter gloves. In a real case, we analyse the gloves.
3A3L82	<p>Association Level Definitions: Level I Association: A physical match; items physically fit and/or align one another by way of corresponding surface characteristics. The associated items were once joined together to form a single item. Level II Association: Items correspond in all observed and measured physical properties and/or chemical composition and share atypical characteristic(s) that would not be expected to be readily available in the population of this evidence type. Level III Association: Items correspond in all observed and measured physical properties and/or chemical composition and, therefore, could have originated from the same source. Other items have been manufactured and/or are naturally occurring that would also correspond to the submitted evidence. Level IV Association: Items correspond in all observed and measured physical properties and/or chemical composition and, therefore, could have originated from the same source. The items share typical characteristics expected to be readily available in the population of this evidence type. Alternatively, an association between items could be categorized as a Level IV Association if a limited analysis is performed. The extent of limited analysis varies. Comparison Terminology Definitions: Physical Match: Associated items physically fit and/or align one another by way of corresponding surface characteristics. The associated items were once joined together to form a single item. Indistinguishable: The questioned sample is the same distinct type of material as the known standard based upon observed and measured physical properties and/or chemical composition. In other words, one could not discern a questioned sample if it were to be mixed with an indistinguishable known standard. Similar: The questioned sample is the same distinct type of material as the known standard based upon a limited analysis. Alternatively, one or more variations existed between the questioned sample and the known standard due to factors such as sample heterogeneity, contamination of the sample(s), or having a sample of insufficient size to adequately assess homogeneity of the entity from which it was derived. Dissimilar: Differences in observed and/or measured characteristics were detected. Inconclusive: No conclusion could be reached regarding an association/elimination. Elimination: The items were dissimilar in observed and/or measured characteristics, indicating that they did not originate from the same source. Methodology: A stereomicroscope was utilized in the general examination of evidence. A comparison microscope with transmitted light and polarized light capabilities is utilized to compare the physical and optical characteristics of trace evidence materials side-by-side in the same optical field up to 600 times magnification. A CRAIC Technologies QDI 2010 microspectrophotometer (MSP) is used to measure the relative intensities of visible and UV light that is transmitted, reflected, or fluoresced by a sample. A Perkin Elmer Spectrum 100 infrared spectrometer (FTIR) with Spotlight 200 microscope accessory is utilized to analyze the chemical characteristics of materials. Disposition of Evidence: All items in the List of Evidence were retained in the laboratory.</p>
4EPNTC	Extracts of the fibres in items 1 and 2 were analysed by HPLC for the presence of dyes. No dyes were observed in the extracts. We concluded that the fibres were coloured by pigmentation rather than by dyeing.
6LPCGX	Fibres from Item 1 and Item 3 are not comparable.
B79XFE	No colour analysis was performed because this laboratory does not have a microspectrophotometer.
CBKTP2	If items 1 and 3 were to contain only one type and color of fiber then it appears there is a contamination problem with the test samples.
CCFA2Y	In addition, a methods and interpretation section would be added to the report.
DPWLRV	Due to the fact that textile materials are mass produced, it is not possible to state that the questioned fibers in this case originated from a particular source to the exclusion of all other textile materials composed of fibers which exhibit the same physical, optical, and/or chemical properties.

TABLE 5

WebCode	Additional Comments
F9LJ8V	<p>Methods: Microscopic examination of textile fibers is accomplished by using one or more analytical techniques including stereomicroscopy, comparison microscopy, polarized light microscopy, fluorescence microscopy, and instrumentally using microspectrophotometry and Fourier transform-infrared spectroscopy. The microscopic characteristics and optical properties determined by these techniques are used for the examination and comparison of fibers. Interpretation: Fibers can differ as to type (e.g., rayon, cotton), color, shape, size, microscopic features (e.g., delustrant, voids) and optical properties (e.g., refractive index, sign of elongation). These are characteristics that may associate fibers with a group of items, but never to a single item to the exclusion of all others. However, even fibers with many similar properties may be excluded as originating from the same source by using the identified analytical methods. The characteristics and optical properties of the fiber(s) are used as comparison criteria. When the characteristics and optical properties of a recovered fiber(s) are the same as a known sample, the recovered fibers are consistent with originating from the source of the known sample, or from another item comprised of fibers that exhibit the same microscopic characteristics and optical properties. A fiber association is not a means of positive identification and the number of possible sources for a specific fiber is unknown. However, due to the variability in manufacturing, dyeing, and consumer use, one would not expect to encounter a fiber selected at random to be consistent with a particular item. The inability to associate persons/items through a microscopic hair/fiber examination does not necessarily mean the persons/items of interest had no contact. A number of factors can produce this result, including: 1) Hair/fiber evidence may not have transferred. 2) Hairs/fibers that did transfer may have been lost prior to submission to the laboratory. 3) The hairs/fibers transferred or the known sample submitted may not be representative of the source. 4) The hairs/fibers may be from a different source.</p>
FPUFNA	<p>Items 1 and 2 are consistent with polypropylene fibers Item 3 is a mixture of polyester fibers</p>
H2EW8R	<p>The fibers in item #1-2 and in item #1-1 could have originated from the same source and have a Type III Association. See Association Key below. The fibers in item #1-3 and in item #1-1 could not have originated from the same source and are an Elimination. See Association Key below. Terminology Key for Associative Evidence: Note: This key provides general statements of association and may not be applicable in every case. Type I Association: A positive identification; an association in which items share individual characteristics that show that the items were once from the same source. Type II Association: An association in which items are consistent in all measured physical properties and/or chemical composition and share unusual characteristic(s) that would not be expected to be found in the population of this evidence type. Type III Association: An association in which items are consistent in all measured physical properties and/or chemical composition and could have originated from the same source. Because similar items have been manufactured or could exist in nature and would be indistinguishable from the submitted evidence, an individual source cannot be determined. Type IV Association: An association in which items are consistent in measured physical properties and/or chemical composition. This sample type is commonly encountered in our environment and may have limited associative value. Type V Association: An association in which items are consistent in some, but not all, physical properties and/or chemical composition. Some minor variation exists between the known and questioned items and could be due to factors such as sample heterogeneity, contamination of the sample(s), or the quality of the sample. Inconclusive: No conclusion could be reached regarding an association between the items. Elimination: The items were dissimilar in physical properties and/or chemical composition and did not originate from the same source.</p>
H462ZX	<p>Because fibers are mass produced, it is not possible to state that a fiber originated from a particular textile source to the exclusion of all other materials composed of fibers which exhibit the same chemical and optical properties.</p>
H6T4F7	<p>Cross section examination was not performed as the matching fibres were microscopically identified as round. If fibres from item 3 were matching, fibres cross section examination would be performed.</p>
J2B4X6	<p>The fibres of item 3 are possibly bi-lobal.</p>
L896ZM	<p>Two populations of Polyester fibres were identified within Item 3. Using FTIR these populations were</p>

TABLE 5

WebCode	Additional Comments
	identified as Polyester - Polyethylene terephthalate and Polyester - Polybutylene terephthalate.
LKYUZT	Because textile materials are mass produced, it is not possible to state that a fiber originated from a particular textile source to the exclusion of all other textile materials composed of fibers which exhibit the same chemical and optical properties. Note: Two different types of polyester were identified in item 3.
MXZTMQ	I have chosen the above phrase [Table 4 - Conclusions] from the following scale: weak support, moderate support, moderately strong support, strong support, very strong support, extremely strong support. If the circumstances are different to those in the background information re-evaluation of the conclusions will be required.
NXVME	Interpretation: The following descriptions are meant to provide context to the opinions reached in this report. Every type of conclusion may not be applicable in every case or for every material type. Type I Association: Identification: An association in which items share individual characteristics and/or physically fit together that demonstrate the items were once from the same source. Type II Association: Association with distinct characteristics: An association in which items correspond in all measured physical properties, chemical composition and/or microscopic characteristics and share distinctive characteristic(s) that would not be expected to be found in the population of this evidence type. The distinctive characteristics were not sufficient for a Type I Association. Type III Association: Association with conventional characteristics: An association in which items correspond in all measured physical properties, chemical composition and/or microscopic characteristics and could have originated from the same source. Because it is possible for another sample to be indistinguishable from the submitted evidence, an individual source cannot be determined. Type IV Association: Association with limitations: An association in which items could not be differentiated based on observed and/or measured properties and/or chemical composition. As compared to the categories above, this type of association has decreased evidential value as a result of items that are more commonly encountered in the relevant population, the inability to perform a complete analysis, limited information, or minor variations observed in the data. Inconclusive: No conclusion could be reached regarding an association or an elimination between the items. Dissimilar: The items were dissimilar in physical properties and/or chemical composition, indicating that the items may not have originated from the same source. However, these dissimilarities were insufficient for a definitive Elimination. Elimination: Items exhibit dissimilarities in one or more of the following: physical properties, chemical composition or microscopic characteristics and, therefore, conclusively did not originate from the same source.
PZDCGJ	It should be noted that our laboratory does not possess a microspectrophotometer for fibre dye comparison purposes. Our laboratory conducts fibre dye comparisons using the technique of High Performance Thin Layer Chromatography. Due to the fibres found in each of items 1 and 2 being composed of polypropylene fibres, no dye could be extracted from the fibres. This is due to the fact that polypropylene fibres are dope-dyed (melt-dyed) where the dye is incorporated into the melted polymer prior to spinning.
QUAMGQ	Two fibers were found in item 3. While they were similar in color, they were different in size and delustrant.
R7YGDY	Item 1, the reference fibers from the known section of the victim's chair, were examined by stereomicroscope, polarized light microscope, comparison microscope, and fourier transform infra-red spectroscopy. Item 2, the questioned fibers collected from the suspect's winter gloves, were examined by stereomicroscope, polarized light microscope, comparison microscope, and fourier transform infra-red spectroscopy. Item 3, the questioned fibers collected from the suspect's pocket knife, were examined by stereomicroscope, polarized light microscope, comparison microscope, and fourier transform infra-red spectroscopy.
RKF3PH	An interpretation section would also be included.
UXCXVY	The item 3 has two type fibres with the same chemical composition but different morphological characteristics.

TABLE 5

WebCode	Additional Comments
WHV749	The FTIR was non-functional therefore could not be used as a confirmatory test.
WM9JTE	Due to the fact that textile materials are mass produced, it is not possible to state that a fiber originated from a particular source to the exclusion of all other textile materials composed of fibers which exhibit the same physical, optical, and/or chemical properties.
WWRZHF	If unknown fibers are being removed from a textile, a known reference sample of the textile could be provided. In my report, olefin would be reported as polyolefin/polypropylene, if not using the attached definition pages.
X2HPHJ	An Association Scale would be included in the report.
X94M77	It would be useful if CTS also included the microscopic, optical and instrumental properties of the items that were submitted for analysis in addition to the results, e.g. Diameter/cross section, refractive indices/sign of elongation/retardation/birefringence, FTIR spectra, and microspectrophotometer data.

Appendix: Data Sheet

Collaborative Testing Services ~ Forensic Testing Program

Test No. 17-539: Fibers Analysis

DATA MUST BE RECEIVED BY March 20, 2017 TO BE INCLUDED IN THE REPORT

Participant Code:

WebCode:

Accreditation Release Statement

CTS submits external proficiency test data directly to ASCLD/LAB, ANAB, and A2LA. Please select one of the following statements to ensure your data is handled appropriately.

- This participant's data is intended for submission to ASCLD/LAB, ANAB, and/or A2LA. (Accreditation Release section on the last page must be completed and submitted.)
- This participant's data is **NOT** intended for submission to ASCLD/LAB, ANAB or A2LA.

Scenario:

Police are investigating the robbery and vandalism of a home. The investigating officers noted that it appeared the upholstery on a chair had been torn during the break-in. A suspect was arrested during the commission of a similar robbery two days later. The day after the arrest, officers searched the suspect's car and collected evidence. Fibers were found on a pair of winter gloves and a pocket knife. Police are requesting that you examine the fibers, report their identification(s), and determine if the fibers found on the suspect's winter gloves and/or pocket knife could have come from the chair in the victim's home.

CTS will not reproduce Interpretation Scales, Scale of Conclusions or Terminology Keys in the final report, please do not submit with the participant's data sheet.

Items Submitted (Sample Pack FIBR):

- Item 1: Known section of the victim's chair
- Item 2: Questioned fibers from the suspect's winter gloves
- Item 3: Questioned fibers from the suspect's pocket knife

Please return all pages of this data sheet.

Page 1 of 4

Participant Code:

WebCode:

1.) Could the questioned fibers from the suspect's winter gloves (Item 2) and/or pocket knife (Item 3) have originated from the victim's chair (Item 1)?

Item 2: Yes No Inconclusive

Item 3: Yes No Inconclusive

2.) Fiber Type Determination.

Please enter the fiber type (Manufactured, Animal, or Vegetable) and generic name in the blank provided for each Item. For Manufactured fibers please use the terminology in the appendix provided.
(Example: **Item 1** Vegetable, Cotton)

Item 1 _____

Item 2 _____

Item 3 _____

3.) Indicate the procedure(s) used to examine the submitted items:

Microscopic Exams: Stereomicroscope Comparison

Polarized Light Fluorescence

Macroscopic Exam IR/FTIR Microspectrophotometry

Solubility Tests Cross-Section Melting Point

Other (specify): _____

Please return all pages of this data sheet.

Participant Code:

WebCode:

4.) What would be the wording of the Conclusions in your report?

5.) Additional Comments

<p>Return Instructions: Data must be received via online data entry, fax (please include a cover sheet), or mail by March 20, 2017 to be included in the report. Emailed data sheets are not accepted.</p>	<p>Participant Code:</p> <p>ONLINE DATA ENTRY: www.cts-portal.com</p> <p>FAX: +1-571-434-1937</p> <p>MAIL: Collaborative Testing Services, Inc. P.O. Box 650820 Sterling, VA 20165-0820 USA</p>
<p>QUESTIONS? TEL: +1-571-434-1925 (8 am - 4:30 pm EST) EMAIL: forensics@cts-interlab.com www.ctsforensics.com</p>	

Please return all pages of this data sheet.

Collaborative Testing Services - Forensic Testing Program

RELEASE OF DATA TO ACCREDITATION BODIES

The following Accreditation Releases will apply only to:

Participant Code:

WebCode:

for Test No. **17-539: Fibers Analysis**

This release page must be completed and received by **March 20, 2017** to have this participant's submitted data included in the reports forwarded to the respective Accreditation Bodies.

Have the laboratory's designated individual complete the following steps **only if your laboratory is accredited in this testing/calibration discipline** by one or more of the following Accreditation Bodies.

Step 1: Provide the applicable Accreditation Certificate Number(s) for your laboratory

ASCLD/LAB Certificate No. _____

ANAB Certificate No. _____

A2LA Certificate No. _____

Step 2: Complete the Laboratory Identifying Information in its entirety

Signature and Title _____

Laboratory Name _____

Location (City/State) _____

Accreditation Release

Return Instructions

Please submit the completed Accreditation Release at the same time as your full data sheet. See Data Sheet Return Instructions on the previous page.

*Questions? Contact us 8 am-4:30 pm EST
Telephone: +1-571-434-1925
email: forensics@cts-interlab.com*

Please return all pages of this data sheet.

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Appendix: Manufactured Fibers - Names & Definitions

Federal Trade Commission

Rules and Regulations Under the Textile Fiber Products Identification Act

16 CFR Part 303

§303.7 Generic Names and Definitions for Manufactured Fibers

Pursuant to the provisions of Section 7(c) of the Act, the Commission hereby establishes the generic names for manufactured fibers, together with their respective definitions, set forth in this section, and the generic names for manufactured fibers, together with their respective definitions, set forth in International Organization for Standardization ISO 2076: 2010(E), "Textiles – Man-made fibres – Generic names."

(a) **Acrylic**

A manufactured fiber in which the fiber-forming substance is any long chain synthetic polymer composed of at least 85% by weight of acrylonitrile units.

(b) **Modacrylic**

A manufactured fiber in which the fiber-forming substance is any long chain synthetic polymer composed of less than 85% but at least 35% by weight of acrylonitrile units, except fibers qualifying under paragraph (j)(2) of this section and fibers qualifying under paragraph (q) of this section.

(c) **Polyester**

A manufactured fiber in which the fiber-forming substance is any long chain synthetic polymer composed of at least 85% by weight of an ester of a substituted aromatic carboxylic acid, including but not restricted to substituted terephthalate units, and para substituted hydroxy-benzoate units. (1) Where the fiber is formed by the interaction of two or more chemically distinct polymers (of which none exceeds 85% by weight), and contains ester groups as the dominant functional unit (at least 85% by weight of the total polymer content of the fiber), and which, if stretched at least 100%, durably and rapidly reverts substantially to its unstretched length when the tension is removed, the term elasterell-p may be used as a generic description of the fiber. (2) Where the glycol used to form the ester consists of at least ninety mole percent 1,3-propanediol, the term "trixta" may be used as a generic description of the fiber.

(d) **Rayon**

A manufactured fiber composed of regenerated cellulose, as well as manufactured fibers composed of regenerated cellulose in which substituents have replaced not more than 15% of the hydrogens of the hydroxyl groups. Where the fiber is composed of cellulose precipitated from an organic solution in which no substitution of the hydroxyl groups takes place and no chemical intermediates are formed, the term lyocell may be used as a generic description of the fiber.

(e) **Acetate**

A manufactured fiber in which the fiber-forming substance is cellulose acetate. Where not less than 92% of the hydroxyl groups are acetylated, the term triacetate may be used as a generic description of the fiber.

(f) **Saran**

A manufactured fiber in which the fiber-forming substance is any long chain synthetic polymer composed of at least 80% by weight of vinylidene chloride units.

(g) **Azlon**

A manufactured fiber in which the fiber-forming substance is composed of any regenerated naturally occurring proteins.

(h) **Nytril**

A manufactured fiber containing at least 85% of a long chain polymer of vinylidene dinitrile where the vinylidene dinitrile content is no less than every other unit in the polymer chain.

(i) **Nylon**

A manufactured fiber in which the fiber-forming substance is a long chain synthetic polyamide in which less than 85% of the amide linkages are attached directly to two aromatic rings.

(j) **Rubber**

A manufactured fiber in which the fiber-forming substance is comprised of natural or synthetic rubber, including the following categories: (1) A manufactured fiber in which the fiber-forming substance is a hydrocarbon such as natural rubber, polyisoprene, polybutadiene, copolymers of dienes and hydrocarbons, or amorphous (noncrystalline) polyolefins. (2) A manufactured fiber in which the fiber-forming substance is a copolymer of acrylonitrile and a diene (such as butadiene) composed of not more than 50% but at least 10% by weight of acrylonitrile units. The term lastrile may be used as a generic description for fibers falling within this category. (3) A manufactured fiber in which the fiber-forming substance is a polychloroprene or a copolymer of chloroprene in which at least 35% by weight of the

Test No. 17-539 Data Sheet, continued

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fiber-forming substance is composed of chloroprene units.

(k) **Spandex**

A manufactured fiber in which the fiber-forming substance is a long chain synthetic polymer comprised of at least 85% of a segmented polyurethane.

(l) **Vinal**

A manufactured fiber in which the fiber-forming substance is any long chain synthetic polymer composed of at least 50% by weight of vinyl alcohol units, and in which the total of the vinyl alcohol units and any one or more of the various acetal units is at least 85% by weight of the fiber.

(m) **Olefin**

A manufactured fiber in which the fiber-forming substance is any long chain synthetic polymer composed of at least 85% by weight of ethylene, propylene, or other olefin units, except amorphous (noncrystalline) polyolefins qualifying under paragraph (j)(1) of this section. Where the fiber-forming substance is a cross-linked synthetic polymer, with low but significant crystallinity, composed of at least 95% by weight of ethylene and at least one other olefin unit, and the fiber is substantially elastic and heat resistant, the term lastol may be used as a generic description of the fiber.

(n) **Vinyon**

A manufactured fiber in which the fiber-forming substance is any long chain synthetic polymer composed of at least 85% by weight of vinyl chloride units.

(o) **Metallic**

A manufactured fiber composed of metal, plastic-coated metal, metal-coated plastic, or a core completely covered by metal.

(p) **Glass**

A manufactured fiber in which the fiber-forming substance is glass.

(q) **Anidex**

A manufactured fiber in which the fiber-forming substance is any long chain synthetic polymer composed of at least 50% by weight of one or more esters of a monohydric alcohol and acrylic acid.

(r) **Novoloid**

A manufactured fiber containing at least 85% by weight of a cross-linked novolac.

(s) **Aramid**

A manufactured fiber in which the fiber-forming substance is a long-chain synthetic polyamide in which at least 85% of the amide linkages are attached directly to two aromatic rings.

(t) **Sulfar**

A manufactured fiber in which the fiber-forming substance is a long chain synthetic polysulfide in which at least 85% of the sulfide linkages are attached directly to two (2) aromatic rings.

(u) **PBI**

A manufactured fiber in which the fiber-forming substance is a long chain aromatic polymer having reoccurring imidazole groups as an integral part of the polymer chain.

(v) **Elastoester**

A manufactured fiber in which the fiber-forming substance is a long-chain synthetic polymer composed of at least 50% by weight of aliphatic polyether and at least 35% by weight of polyester, as defined in 16 CFR 303.7(c).

(w) **Melamine**

A manufactured fiber in which the fiber-forming substance is a synthetic polymer composed of at least 50% by weight of a cross-linked melamine polymer.

(x) **Fluoropolymer**

A manufactured fiber containing at least 95% of a long-chain polymer synthesized from aliphatic fluorocarbon monomers.

(y) **PLA**

A manufactured fiber in which the fiber-forming substance is composed of at least 85% by weight of lactic acid ester units derived from naturally occurring sugars.