

OSAC RESEARCH NEEDS ASSESSMENT FORM



Title of research need: Fluorescence in Forensic Fiber Examinations

Keyword(s): fluorescence, fibers, microscopy

Submitting subcommittee(s): Chemistry Trace Materials **Date Approved:** 6/12/2025

Background Information:

1. Does this research need address a gap(s) in a current or planned standard? (ex.: Field identification system for on scene opioid detection and confirmation)

Yes, the 2021 CTS Fiber proficiency test revealed differences in how laboratories are examining fibers, with those who included fluorescence microscopy having more reliable results versus those who did not use fluorescence for screening or comparison of the fibers. Most of the latter were unable to recognize differences between the sets of fibers.

2. Are you aware of any ongoing research that may address this research need that has not yet been published (e.g., research presented in conference proceedings, studies that you or a colleague have participated in but have yet to be published)?

No

3. Key bibliographic references relating to this research need: (ex.: Toll, L., Standifer, K. M., Massotte, D., eds. (2019). Current Topics in Opioid Research. Lausanne: Frontiers Media SA. doi: 10.3389/978-2-88963-180-3)

- Heider EC., Nirvani M, Campiglia A.D. "Identification of detergents for forensic fiber analysis." Analytical and bioanalytical chemistry 408.28 (2016): 7935-7943.
- Goodpaster J. V., Liszewski E.A. "Forensic analysis of dyed textile fibers." Analytical and bioanalytical chemistry 394.8 (2009).
- Grieve, M.C., Dunlop J., Haddock P. "An assessment of the value of blue, red, and black cotton fibers as target fibers in forensic science investigations." Journal of Forensic Science 33.6 (1988): 1332-1344.
- Hartshorne A.W., Laing D.K.. "Microspectrofluorimetry of fluorescent dyes and brighteners on single textile fibres: Part 1—Fluorescence emission spectra." Forensic science international 51.2 (1991): 203-220.
- Hartshorne A.W., Laing D.K.. "Microspectrofluorimetry of fluorescent dyes and brighteners on single textile fibres: Part 2—Colour measurements." Forensic science international 51.2 (1991): 221-237.
- Morgan, S. L., Nieuwland, A.A., Mubarak, C.R. "Forensic discrimination of dyed textile fibers using UV-VIS and fluorescence microspectrophotometry." Proceedings of the European Fibres Group (2004): 1-11.

4. Review the annual operational/research needs published by the National Institute of Justice (NIJ) at <https://nij.ojp.gov/topics/articles/forensic-science-research-and-development-technology-working-group-operational#latest>? Is your research need identified by NIJ?

No

5. In what ways would the research results improve current laboratory capabilities?

These studies would aid in determining the wavelength ranges that provide the highest discriminating capabilities among fibers commonly encountered in forensic casework. The amount of time fibers are exposed to excitation sources can affect a fiber's ability to fluoresce, but this time frame is not specifically known nor has the length of time it takes for dyed fibers to become quenched or photobleached been well- established for fluorescence microscopy. In casework, fiber examiners have found variability in the fluorescence of fibers analyzed, but do not have studies that identify the effects exposure to chemicals used in collecting or preserving evidence for other forensic disciplines (e.g., phenolphthalein, superglue fuming) have on fibers, or if there are manufacturing- specific or environmental contaminants that have the potential to alter the fluorescence properties of textile materials. Such information would be informative to better understand the level of discrimination of fluorescence microscopy in a forensic fiber analysis scheme and whether including fluorescence analysis could reduce false inclusions and false exclusions. Outcomes from these studies will be expected to assist fiber examiners with their understanding of, and ability to explain, differences of fluorescence properties observed during comparative examinations of textile fibers.

6. In what ways would the research results improve understanding of the scientific basis for the subcommittee(s)?

The fiber task group is planning on writing a document on Fluorescence Microscopy for Fiber analysis

7. In what ways would the research results improve services to the criminal justice system?

It would reduce false inclusions and false exclusions during comparative examinations of fibers that could be discriminated should analysis using fluorescence microscopy be regularly employed in a forensic fiber analysis scheme. It may also give examiners a better understanding of the significance of their findings.

8. Status assessment (I, II, III, or IV):

	I		
		Major gap in current knowledge	Minor gap in current knowledge
No or limited current research is being conducted		I	III
Existing current research is being conducted		II	IV

This research need has been identified by one or more subcommittees of OSAC and is being provided as an informational resource to the community.