OSAC RESEARCH NEEDS ASSESSMENT FORM

Title of research need: Understanding photodegradation-induced differences in coatings

Keyword(s): forensic science, paint, interpretation

Submitting subcommittee(s): 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)

Current standard documents ASTM E1610-18 Standard Guide for Forensic Paint Analysis and Comparison, or ASTM E2937-18 Standard Guide for Using Infrared Spectroscopy in Forensic Paint Examinations address the questions related to the criteria to conduct comparative examinations. However, all these documents do not offer guidance on the interpretation of slight dissimilarities. Photodegradation is known to provide such dissimilarities in paints being exposed to the exterior environment, potentially leading to false exclusion of source.

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)

Bolduc, Massonnet, Muehlethaler. Homogeneity of automotive paint system: Evaluation of chemical variability and degradation. Forensic Science International. 396 (2025) 112413.
van der Pal, Sauzier, Maric, van Bronswijk, Pitts, Lewis. The effect of environmental degradation on the characterisation of automotive clear coats by infrared spectroscopy. Talanta, 148 (2019) 715-720.
Jost, Muehlethaler, Massonnet, Forensic aspects of the weathering and degradation of paints, Forensic Science International, 258 (2016) 32-40.

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?

There is an important lack of knowledge and literature on paint aging and degradation, especially in the field of forensic science. While most contributions are from the automotive industry (Ford research group) to improve paint formulations and durability, very few published articles are addressing forensic questions (paint identification, source attribution, aging behaviour, dating). The research will include an independent evaluation of the influencing factors, a synergistic approach using natural and accelerated weathering, and the creation of a compendium of chemical signatures for degraded polymers.

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

The laboratory would benefit from having a comprehensive database of chemical signatures organized by paint compositions, analytical methods, and degradation conditions (before/after) which will let them search for reference spectra/chromatograms and eventually extrapolate the degradation mechanisms.

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

Research studies in these areas are projected to provide valuable information during comparison processes through identification and explanation of potential explainable dissimilarities.

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

	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.