B90   **Crowbar Paints in Forensic Investigations With In-Depth Techniques: A Casework Investigation and the Start of a Multi-Technique Database**

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Learning Overview: This presentation addresses the application of highly discriminating multi-technique investigations in crowbar paint investigations, demonstrates how information on the background variation can be obtained, and how these results can be used in reports to assist the court.

Impact on the Forensic Science Community: This presentation will impact the forensic science community by demonstrating how detailed information can be extracted from the paints and used in highly discriminating in-depth comparison investigations, how to obtain information on the meaning of any matches found, and interpret and report this information to the courts.

Crowbar paints are often very discernible (e.g., an orange crowbar paint on a white door frame in a burglary). The preconception was that the paint in many situations consists of a single layer. As in most other forensic institutes, the backbone of the Netherlands Forensic Institute (NFI) paint investigation is the visual investigation and comparison of paints using microscopy and Fourier Transform Infrared (FTIR) investigations. A database of FTIR data with 49 orange/red burglary tool paints is presently used for reference purposes and to assist in interpretation. For interpretation, a likelihood approach is used in which the probability of results in the prosecutors' scenario is estimated relative to the results in the defense scenario. A Likelihood Ratio (LR) range approach is used and expressed in verbal terms.

At the NFI in recent years Laser Ablation-Inductively Coupled Plasma/Mass Spectrometry (LA-ICP/MS) is also used in paint investigations. Results will be presented for a single series of five attempted burglaries where orange-red paint found at the site of the burglaries is compared to original paint from a crowbar as found with a suspect, and paints found on the crowbar are compared to original paints from the sites of the burglaries to determine potential paint cross-transfer. Results from microscopic, FTIR, and LA-ICP/MS investigations from this casework investigation complex will be presented and discussed.

Conclusions for these five burglaries ranged from appreciably more probable (LR 100–10,000), through more probable (LR 10–100), and slightly more probable (LR 2–10), to approximately equally probable (LR 1–2) that the investigated object had been in contact with the orange-red crowbar under investigation relative to the situation that the investigated object had been in contact with another at-random orange-red crowbar.

For one attempted burglary, the transferred orange-red paint was clearly different from the crowbar under investigation but might have been transferred from another orange-red crowbar. Therefore, for this specific attempted burglary, no indication was found that the investigated object had been in contact with the orange-red crowbar under investigation.

As part of further improvement of the NFI crowbar paint investigation process, paints from a set of 21 orange/red crowbars and 13 paint samples from orange/red crowbars were investigated using the above techniques. In addition, Liquid Chromatography/Mass Spectrometry (LC/MS) was used to obtain information on colorants.

Overall, more than 50 (organic and inorganic) colorants and some colorant/binding-related organic compounds were identified using LC/MS.

Visual, FTIR, LC/MS, and LA-ICP/MS results will be presented for these paints and discussed. Variation within the paint on a single crowbar using these techniques will be addressed. In this way, information on the background variation (variation in these characteristics for visually similar orange and orange-red paints of crowbars, unrelated to the crime being investigated) can be extracted for these characteristics.

Discussion will include how to use the results from this limited set of paints to assist in the interpretation of matches in crowbar paint comparisons to visually similar paint observed (e.g., at a burglary site).

Crowbar Paint, LC/MS, LA-ICP/MS

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