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## **Analytical and Transfer Characteristics of a Fluorescent Detection Spray: Implications for subvisible and nanotrace particle transfers**

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### Highlights

- Microanalytical characterization of Clue Spray, a common fluorescent tracer
- Aid investigators in utilizing fluorescent tracers in a rigorous, scientific manner
- Illustrates the potential of high-order transfers of sub-visible particles
- Provides multiple orthogonal methods to detecting and identify fluorescent tracers
- General applicability of method to other forms of subvisible and nanotrace evidence

### Abstract

Fluorescent detection sprays are applied to objects to elucidate evidence of contact. Billed as an invisible powder, evidence of contact between objects may be visualized through illumination by ultra-violet light, which causes the fluorescent tracer to luminesce. While the presence of the fluorescent powder on a suspect or object is often used as evidence of direct contact, the fine nature of the powder, which is comprised of sub-visible particles that are generally less than 10  $\mu\text{m}$  in diameter, lends itself to higher-order transfers that do not necessarily involve the original object. Due to the small particle size and light-yellow color, the particles are generally invisible to the unaided eye in white light. This increases the opportunity for unwanted or unanticipated transfers (i.e., contamination). This article provides a microanalytical characterization of a common fluorescent tracer and the approaches by which this powder (or analogous powders) may be applied, detected, and specifically identified in quantities that range from major to trace. This research illustrates the ease of higher order cross-transfers (up to the 10th order) and the considerations necessary to maximize the evidentiary value of sub-visible particles and nanotraces, while minimizing the chances of cross-contamination.

### Keywords

Tracer, zinc sulfide, Clue Spray, fluorescence, subvisible, particle analysis, nanoparticle, GSR

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