

A Review on Latent Fingerprint Detection Using Carbon Dots in Liquid Form

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Structured Abstract

Background: Latent fingerprints are commonly found in crime scenes, and they are usually detected using powder dusting methods. However, this method owns some limitations such as low contrast, selectivity, apparent background interference, and health risks. Carbon dots (CDs) in liquid form offer advantages like strong contrast, good selectivity, and environmental friendliness.

Methods: The systematic literature review (SLR) is guided by established guidelines. Research questions are formulated using the PICO technique, considering CDs (Population), liquid form (Interest), and fingerprint detection (Context). A search strategy was developed, followed by identification, screening, and eligibility processes. The quality assessment guidelines proposed by Kitchenham and Charters were used for quality appraisal. The research topic was used for the extraction and analysis of the 25 articles selected, and the results were analysed using thematic synthesis.

Results: Out of 25 articles, 15 are from China, four are from India, while the remaining studies focus on Turkey, Japan, Thailand, South Africa, Spain, and Italy. Three studies were published in 2023, four in 2022, five in 2021, four in 2020, five in 2019, three in 2018, and one in 2017. 22 studies used mixed methods, two using qualitative research and one focusing on quantitative analysis. All 25 articles were indexed by Scopus and Web of Science databases. Thematic analysis identified five primary themes which are CDs synthesis, characterisation techniques, latent fingerprint detection, application of CDs for latent fingerprint detection in liquid form, and performance evaluation followed by another 13 sub-themes.

Conclusion: CDs are ideal for latent fingerprint detection due to their nanosize, strong photoluminescence, and easy modification. The hydrothermal method offers optimal size control and well dispersibility. Characterisation techniques like FTIR spectroscopy, XPS, TEM, and UV-Vis spectroscopy ensure the quality and performance of CDs. The spray (liquid) method of red-emissive CDs (rCDs) stands out as the most effective method due to its high sensitivity, good selectivity, low cost, and environmentally safe.

Keywords: Carbon dots, fingerprint detection, liquid, photoluminescence

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