Chapter 15
International Activities in Nano-Forensics

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ABSTRACT

Nanotechnology has proven its supremacy with enormous applications to outdated methods in medical, electronic, engineering, and other fields. In forensic science, nanotechnology research has delivered a new viewpoint for real-time crime investigation and established progressive nano sensors, nano-manipulators, and nano-imaging tools for visualization. Often, nanotechnology helps in augmenting and improving the productivity of already existing and applied forensic techniques with high precision, sensitivity, and reducing the time required. So, this chapter reviews international activities in nano forensic in different branches of forensic science (e.g., for inspecting questioned documents, age of bloodstains, and time since death, along with its application in improving PCR efficiency, DNA analysis, and explosive detection). Therefore, in this chapter, an effort has been made to highlight the new outlook or knowledge of nanotechnology with its applications in several divisions of forensic science at an international level.

SUMMARY

Nanotechnology has consistently demonstrated its unparalleled quality through massive applications to obsolete techniques in clinical, electronic, design, and other fields. In the field of forensic science, nanotechnology research has given another viewpoint to continuous misconduct examination and estab-

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lished reasonable Nano sensors, Nano-controllers, and Nano-imaging devices for perception. Frequently, nanotechnology aids in the expansion and enhancement of previously existing and practical methods with high accuracy, awareness, and reduced time requirements. In that method, this section examines Global practices in Nano technology in various areas of forensic sciences, such as reviewing addressed reports, age of bloodstains, and post mortem interval, as well its application further developing PCR productivity, DNA examination, and sensitive identification. Furthermore makes an effort to highlight the use of cutting-edge nanotechnology tools for illegal medication screening. Nano-based practices have a bright future in fingerprinting and security highlights. As a result, this chapter also provides information on the applications of nanoparticles in recognising idle fingerprints. The development of Nano sensors replaces large cumbersome instruments with much smaller chip-based stages. This greatly aids false examination as well as recognising unknown proof in a more limited examination technique for examination with greater precision and responsiveness for resolving violations. As a result, this chapter is an effort to present a new perspective or information on nanotechnology and its applications in a few divisions of Forensic sciences on a global scale.

WHAT ARE NANOTECHNOLOGY AND NANO FORENSICS?

Introduction

Nanotechnology is a branch of science, with important applications in a variety of other fields. Nanotechnology also has a important impact on forensic science. Nano-forensics is the use of nanotechnology-based methods to solve forensic science cases. (Kumar & Sharma, 2021). This is known as Nano-forensics, and it is the most recent advancement in the field of forensic science. Nanotechnology aids technology that deals with nanometer-sized matters. The term "nanoparticle" is typically applied to inorganic materials opposed to single molecules. Ultrafine particles are the same as nanoparticles and range between 1 and 100 nm in size, whereas fine particles range between 100 and 2,500 nm, and coarse particles range between 2,500 and 10,000 nm. (Brayner et al., 2012). There are many ways to make nanoparticles, including chemical, physical, and biological processes. While the chemical technique of synthesis only requires a little time to produce a high number of nanoparticles, this method requires capping agents to maintain the size of the nanoparticles. Nanoparticle production and stabilisation chemicals are toxic and produce byproducts that are bad for the environment. The demand for green nanotechnology is driven by the need for environmentally safe, non-toxic synthetic processes for the manufacture of nanoparticles. (Bar et al., 2009).

Nanoparticles put forward fundamentally advantageous platform, validating unique properties with potentially wide-ranging application (Murray, Kagan, & Bawendi, 2000). Many research teams have using biological systems for the synthesis of nanoparticles due to the numerous advantages they offer over non-biological systems. Due to a number of reasons, comprising their similar size to biomolecules like proteins and poly nucleic acids, nanoparticles have unique capabilities and are useful (Akhlaghi,Peng, Yao, & Tam, 2013).