Advances in the Forensic Analysis of Glass Fragments with a Focus on Refractive Index and Elemental Analysis

ABSTRACT: Advances in technology provide forensic scientists with better tools to detect, to identify, and to individualize small amounts of trace evidence that have been left at a crime scene. The analysis of glass fragments can be useful in solving cases such as hit and run, burglaries, kidnappings, and bombings. The value of glass as "evidentiary material" lies in its inherent characteristics such as: (a) it is a fragile material that is often broken and hence commonly found in various types of crime scenes, (b) it can be easily transferred from the broken source to the scene, suspect, and/or victim, (c) it is relatively persistent, (d) it is chemically stable, and (e) it has measurable physical and chemical properties that can provide significant evidence of an association between the recovered glass fragments and the source of the broken glass. Forensic scientists have dedicated considerable effort to study and improve the detection and discrimination capabilities of analytical techniques in order to enhance the quality of information obtained from glass fragments. This article serves as a review of the developments in the application of both traditional and novel methods of glass analysis. The greatest progress has been made with respect to the incorporation of automated refractive index measurements and elemental analysis to the analytical scheme. Glass examiners have applied state-of-the-art technology including elemental analysis by sensitive methods such as ICP-MS and LA-ICP-MS. A review of the literature regarding transfer, persistence, and interpretation of glass is also presented.