

Use the X-ray Diffraction in Forensic Science as a Device for Phase Analysis

Marek Kotrly, *Institute of Criminalistics Prague (ICP), Czech Republic*. E-mail: kotrly.kup@email.cz

Phase identification, material comparison and quantification are basic tasks in a forensic science. Importance of XRD phase analysis in forensic science lies namely in: analysis of relatively small-volume samples, relatively non-destructive (probative value is preserved), exact phase analysis (unlike other instrumental chemical methods), quantitative analysis (in majority of cases), conclusive for a court. However, XRD analysis is not a very popular technique in forensic science community and is routinely used in only a few specialized laboratories (e.g. FBI (USA), BKA (Germany), FSS (England), NFI (Netherlands), central laboratories in Poland, Ukraine and Russia, laboratories in Japan and Australia). XRD analysis is currently employed at ICP in 7 main areas: Soils –EDS/WDS, XRF, FTIR, etc. are not able to perform exact determination of phases, namely aluminosilicates. Explosives and post-blast residues – direct determination of inorganic components. Pigments and paints – phases of artworks, car paints, lacquer systems of tools, building industry and some printing colours. Type and origin of goods – customs and financial frauds, counterfeit, money laundering, etc. Unknown substances, poisons and contaminants - industrial accidents and leakage, threatening and extortionate letters, etc. Degraded skeletal remains – burnt, damaged or unusual fragments undeterminable by standard anthropological techniques. Quantitative drug analyses –higher precision of quantitative analysis compared with FTIR and GC. XRD is faster and its preparation is simpler.

Keywords: forensic microanalysis, powder diffraction, phase analysis