



RECENT ADVANCES IN NUCLEAR FORENSIC SCIENCE – THE IDENTIFICATION OF UNKNOWN NUCLEAR MATERIALS AND CO-OPERATION WITH THE LEGAL AUTHORITIES

I.L.F. RAY, A. SCHUBERT, R. SCHENKEL

European Commission Joint Research Centre, Institute for Transuranium Elements
Karlsruhe, Germany.

Nuclear Forensic Science is a new branch of forensic science, which has arisen out of necessity following the dissolution of the former Soviet Union and East Block countries. One result of this break up was the emergence of a new form of smuggling, involving nuclear materials, radioactive sources and scrap metal contaminated with radioactive substances.

Since 1994 the Institute for Transuranium Elements of the European Commission Joint Research Centre has played a major role in combating the illicit trafficking in nuclear materials and contaminated scrap metals. The Institute has the advantages of extensive experience in handling these materials, which require sophisticated instruments mounted in glove boxes. As part of the European Commission Joint Research Centre the Institute is also independent of national interests within the European Union and abroad.

Some twenty-five cases of illicit trafficking have been examined so far. Some of the latest cases will be described and the methods developed at the Institute for isotopic and microstructural fingerprinting of nuclear materials will be illustrated. The microstructural fingerprint is a new technique developed here, which complements the isotopic analysis of the samples, and is highly characteristic of the production process and subsequent history of the materials involved. Furthermore, the microstructural fingerprint cannot be disguised by, for example, the addition of other substances or isotopes to the sample.

An extensive database on commercial nuclear materials is maintained by the Institute, and this is being enlarged to include microstructural information such as porosity, grain size, precipitation, dislocation structures, pellet surface roughness, etc. The database can be used for comparison when samples of unknown provenance are seized.

The Institute places emphasis on developing close co-operation with the legal authorities to optimize the side-by-side working of law enforcement officers and nuclear scientists, and the effective preservation of conventional forensic information (such as fingerprints, for example,) on seized radioactive samples. Examples will be given of co-operation with the law enforcement authorities.