

Nuclear Forensic Characterization of Uranium Ore Concentrates by Fourier-transformation Infrared Spectroscopy

Fourier-transformation Infrared Spectroscopy (FTIR) is an analytical method used to determine the infrared spectrum of the absorption, emission, photoconductive or Raman-scattering of solid, liquid or gaseous substances. Therefore FTIR allows the determination of the chemical composition or the molecular structure of substances, therefore it can be considered as a suitable technique for origin assessment of different type of nuclear materials.

The FTIR technique has been known in the field of nuclear forensics for many years, however it is not widely used in advanced nuclear forensic examination as compared with more advantages and more precise data obtained by X-Ray Diffraction measurements. On the other hand, it offers a good alternative to expensive largescale equipment as a cheap, fast and simple technique for less developed countries with limited capacity of analytical techniques used for nuclear forensics.

In our measurements, several uranium ore concentrate samples were analyzed with various but known origin. The aim of this study was to identify the uranium molecular components of the samples as well as other possible technological impurities, that could collectively provide information on the manufacturing method, i.e. the origin of the material.

After comparing the infrared spectra of the different samples partly with the same, partly with different origin, it was obtained that even for samples with the same chemical composition, it was possible to identify differences between the uranium ore concentrate samples. That is why the technique provides a reliable solution for the qualitative identification of uranium ore concentrates and a simple but effective tool for origin assessment.

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