Contribution ID: **83** Type: **Poster Presentation**

UNDERGROUND RADIOACTIVITY MEASUREMENTS OF METEORITES

Monday, May 2, 2022 12:50 PM (15 minutes)

Meteoroids are activated by cosmic rays during their travel through space. Formation of specific radionuclides in meteoroids enables nuclear dating of recovered meteorites. It is of interest to determine their (i) formation age, (ii) cosmic age (time since breakup) and (iii) terrestrial age. Furthermore, radionuclides can help to determine the original size of a meteoroid by investigating the different massic activities of recovered individual pieces of meteorites and distribution of radionuclides inside each piece. However, unique nature of meteorites and usually limited amount of material available for studies triggers necessity to apply analytical methods as non-destructive as possible. Gamma-ray spectrometry is therefore a useful tool for investigation, especially applied to meteorites immediately after the fall, when also relatively short-lived radionuclides like Be-7, Na-22, Cr-51, Co-57, Mn-56 and Co-60 can be detected.

In this study a recent stony meteorite found in Libya in the Hammadah al Hamra region (HaH 346) was studied to provide constrains regarding its fall date. The specimen comes from a huge fall that was observed but reports of the date of the fall are ambiguous and differ by almost a year. As an additional complication, the location of fall differs by about 100 km. The specimen measured weighed 498 g and was of irregular shape, to some extent resembling a tetrahedron. Since first, laboratory-based measurements of this piece did not conclusively determine the terrestrial age a high sensitivity measurement was performed in the underground laboratory HADES (EUFRAT).

The low background in HADES enabled long measurement time and allowed to measure the piece at several distances from the detector to minimise systematic uncertainties arising from the irregular shape. Furthermore, a 3D-scanning of the piece was developed and introduced in the Monte Carlo code that calculates corrections for efficiency and coincidence summing.

In the paper we will describe metrological aspects of this particular study to accurately determine the terrestrial age of meteorite. Furthermore, the methodology to introduce adequate correction factors will be described. Also, we will present the methodology for calculating the uncertainty associated with nuclear dating.

Primary authors: TYMIŃSKI, Zbigniew (Radioisotope Centre POLATOM, National Centre for Nuclear Research); SAGANOWSKI, Paweł (Radioisotope Centre POLATOM, National Centre for Nuclear Research); HULT, Mikael (EC-JRC); Dr LUTTER, Guillaume (Department of Environmental Engineering, Technical University of Denmark); Dr KRZESIŃSKA, Agata M. (University of Oslo, CEED, Dept. Of Geosciences); Dr TYMIŃSKA, Katarzyna (National Centre for Nuclear Research)

Co-authors: Mr ZIEMEK, Tomasz (Radioisotope Centre POLATOM, NCBJ); Dr EL-MALLUL, Ahmed (Libyan Meteorite Society)

Presenter: TYMIŃSKI, Zbigniew (Radioisotope Centre POLATOM, National Centre for Nuclear Research)

Session Classification: Applications

Track Classification: Applications