Actinides and Rare Earths Focus Topic
Room Oregon Ballroom 203-204 - Session AC-TuP
Actinides and Rare Earths Poster Session

AC-TuP-2 Magnetic Properties of Lu doped Ce-Fe-B Magnets, ***Alex Bretaña***, *B. Rai, C. Housley, H. Ajo,* SRNL*; G. Morrison, H. zur Loye,* University of South Carolina

Permanent magnets are integral components needed for future clean energy technologies, however the growing demand for Nd-Dy and Sm-Co based permanent magnets is exacerbating the current critical materials shortage. Designing, developing, and optimizing critical material free permanent magnets is essential for the future economy. $Ce_2Fe_{14}B$, based on $Nd_2Fe_{14}B$ permanent magnets, is an attractive low-cost alternative due to the highly abundant rare-earth Ce, however, it displays several drawbacks, a rather low Curie temperature T_C, as well as a low magnetocrystalline anisotropy. Chemical substitutions have been shown to improve both T_C and the magnetic properties; Co, La, Ni, and Si have been shown to improve T_C , while La and Co have also been shown to improve the saturation magnetization, M_S, while Hf, Ga, Ge, Ti, and Zr doping improved the magnetic properties though microstructure and grain refinement. We prepared Lu doped $(Lu_xCe_{2-x})Fe_{14}B$ (x = 0.05,0.1, and 0.15) alloys and studied their microstructure and magnetic properties before and after heat treatment. In this presentation, we will present X-ray diffraction, scanning electron microscopy and energy dispersive X-ray spectroscopy measurements, as well as temperature dependent magnetization and isothermal magnetization measurements on Lu doped $Ce_2Fe_{14}B$.

AC-TuP-3 A Novel Approach to the FTA Procedure for Nuclear Forensics, ***Itzhak Halevy***, Ben Gurion uni., Israel*; R. Babayew, Y. Yehuda-Zada, N. Elgad,* Engineering and Physics Departments, Nuclear Research Centre Negev, Beer-Sheva, Israel*; J. Lorincik,* Nuclear Fuel Cycle Department, Research Centre Rez, Czech Republic*; I. Orion,* Unit of Nuclear Engineering, Faculty of Engineering Sciences, Ben-Gurion University of the Negev, Israel*; A. Weiss,* Faculty of Engineering, Bar Ilan University, Israel*; G. Katarivas Levy,* Department of Biomedical Engineering, Faculty of Engineering Sciences, Ben-Gurion University of the Negev, Israel

Our laboratory has created a novel approach to the FTA procedure.

The query posed pertains to the presence of supplementary data within the detector image, beyond the star's spatial coordinates. Are there any further physical factors that hold forensic significance?

The acquisition of these novel findings was made possible through the creation of a state-of-the-art simulation tool, known as Trainer, specifically designed for the examination of fission stars.

The simulator in question is utilized for conducting a comprehensive examination of an individual fission star, as well as for generating an image that closely resembles the image acquired by a standard light microscope.

One significant initial finding is the feasibility of identifying the specific fissile isotope by an analysis of the trace lengths observed in the Lexan detectors. Another significant outcome is the capacity to examine individual fission traces arising from minuscule particles of fissile material (D<0.1µm), which cannot be individually quantified using instrumentation like ICPMS-MC or comparable devices.

One notable finding is the relatively poor efficacy associated with the detection of individual fission traces. This phenomenon can be attributed to multiple sources. The acquisition of a fission trace is contingent upon the presence of a minimum angle between the fission trace and the lexan detector, which varies for each isotope. If this angle falls below the specified threshold, no fission trace will be observed. The circular trace produced by the fission product at an angle near 90 degrees exhibits a diameter of approximately one micron, posing challenges in its identification and differentiation from the surrounding background noise.

The newly developed "Trainer" simulator provides a platform for novice employees to engage in practical exercises aimed at facilitating their journey towards certification. This simulator also incorporates an evaluative component, enabling the assignment of a performance grade to individuals based on their simulated performance. Currently, there exists the capability to generate a substantial repository of images that can be utilized as a foundational resource for machine learning through the implementation of artificial intelligence techniques.

The coloring of traces in the Lexan detector is a novel product that is dependent on their depth. Initial investigations conducted using a fluorescent microscope have indicated the potential viability of this novel approach.

Our objective is to minimize the extensive etching of the Lexan detector, both in terms of temperature and duration, in order to enhance traceability in the Lexan.

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