

Plenary Talk

PV V Tue 9:00 RW 1

From reactors to stars: Decoding nuclear histories from tiny grains of matter — ●MICHAEL SAVINA — Lawrence Livermore National Laboratory, Livermore CA, USA

Nuclear reactors, whether in terrestrial facilities or the cores of stars, induce profound changes in the isotopic and elemental composition of matter. The high specific activity of spent fuel from nuclear reactors makes handling macroscopic quantities problematic, while in the case of stars only microscopic stardust grains have survived the journey to Earth and are available for study. Therefore in both cases one is trying to reconstruct the irradiation history of the material from a handful of tiny particles. This places a premium on extracting maximum infor-

mation from minimal material.

Over the past 30 years, my international colleagues and I have advanced a form of laser-based mass spectrometry known as resonance ionization mass spectrometry (RIMS) to tackle these so-called “atom-limited” analyses, in which one cannot purify or isolate the elements of interest. These unique instruments have given us insights into the conditions inside nuclear reactors, as well as the creation of elements in stars. I will briefly discuss the basic science behind the technique, highlight the important knowledge gained from these tiny and often precious samples, and describe how the knowledge gained over the years has enabled us to embark on the design and construction of a new generation of instruments designed to move RIMS from boutique to routine. LLNL-ABS-2015057