



Contribution ID: 177

Type: **Oral Contribution**

Search for Supernova R-process actinides in fossilized reservoirs

Tuesday 25 October 2022 17:30 (20 minutes)

Even though GW170817 and the associated kilonova from a neutron-star merger were detected in August 2017, the possible sites of r-process elements remain an open question in nuclear astrophysics, including special kinds of core-collapse supernovae (CCSNe). A well-known supernova-produced ^{60}Fe radioisotope has been found in several terrestrial reservoirs proving that material from the ejecta of a nearby supernova arrived on earth in the last several millions of years [1]. If live r-process isotopes were to be found in temporal coincidence with the ^{60}Fe peak, it would provide strong evidence to the r-process occurring in CCSNe. The radioisotope ^{244}Pu has been chosen, as it is an r-process only isotope and has a very long half-life, providing the same conditions as for ^{60}Fe . Unfortunately, it is much less abundant than even ^{60}Fe , and therefore a highly concentrated reservoir must be found. Candidates for this type of investigations were found in Atacama Desert, Chile, and Turkana Basin.

A great challenge that arises during the ^{244}Pu investigations is the inherent anthropogenic contamination with Plutonium isotopes released during the atmospheric nuclear weapon tests. The AMS (Accelerator Mass Spectrometry) measurements and sample preparation were carried out using the 1MV Tandatron Accelerator installed at the RoAMS Laboratory at IFIN-HH, Romania [2, 3].

Anthropogenic plutonium results obtained while investigating fossils from Turkana Basin and Atacama Desert will be presented along with data for certified reference materials and data on interstellar Pu-244.

Acknowledgements: This research was supported by the Collaborative Research Center SFB1258 of the Deutsche Forschungsgemeinschaft (SFB1258), Romanian Government Programme through the National Programme for Installations of National Interest (IOSIN). We are grateful to Dr. Livius Trache, Dr. Gihan Velisa, Dr. Mihai Straticiu and Dr. Lucio Gialanella for their unconditional institutional support.

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Session Classification: P3 Nuclear Astrophysics

Track Classification: P3 Nuclear Astrophysics