#0218

Effects of secondary neutron capture on isotope systematics – importance of target composition.

Sprung*, P., Kruijer, T.S., Kleine, T., Scherer, E.E.,
*Institut für Planetologie, Westfälische Wilhelms-Universität Münster, Wilhelm-Klemm-Str. 10, 48149 Münster, sprungp@uni-muenster.de.

Many meteorites and lunar samples have been exposed to galactic cosmic rays over long intervals resulting in nuclear reactions, including secondary neutron production. Capture of such neutrons can strongly falsify measured isotope ratios and lead to erroneous interpretations of isotope data for extraterrestrial samples [e.g., 1,2]. Here, we show that combined analysis of non-radiogenic Hf (mainly affected by epithermal neutrons) and Sm (mainly affected by thermal neutrons) isotope compositions readily constrains a) the neutron energy spectrum and b) the total neutron fluence of a sample. Both are crucial for correcting neutron capture (NC) effects [e.g., 1,2]. Using a set of meteorites and lunar samples, we document the importance of target composition and find that in Fe-dominated matrices, epithermal NC reactions dominate, whereas in silicate matrices, high contents of incompatible trace elements promote epithermal over thermal NC reactions. These systematics and implications for choosing appropriate NC monitors will be explored.

[1] Sprung, P. et al. (2010) EPSL 295, 1–11. [2] Sprung, P. et al (2012) 43rd LPSC, march 2012, abstract #2194.

Cite abstract as:
Sprung, P., Kruijer, T.S., Kleine, T., Scherer, E.E. (2012) Effects of secondary neutron capture on isotope systematics ? importance of target composition.. Paneth Kolloquium, Nördlingen (Germany), abstract URL: http://www.paneth.eu/PanethKolloquium/2012/0218.pdf (abstract #0218).