Nucleosynthetic isotope anomalies in planetary materials as tracers of early solar system processes

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The discovery of presolar materials in chondritic meteorites [1], and even more so the finding that the isotopic signatures carried by these materials are heterogeneously distributed in the solar nebula on a planetary scale [2] [3], provides challenges as well as exciting possibilities for the fields of geo- and cosmochemistry. On the negative side stands the loss of the paradigm of a chondritic uniform reservoir as isotopic proxy of the bulk Earth and other planetary bodies. This can add additional degrees of freedom to the interpretation of geochemical data, *e.g.*, for the interpretation of the ^{142}Nd record with respect to early Earth differentiation [4] [5]. However, for many other research areas the micro- and macroscopic isotopic heterogeneities seen in planetary materials open up exciting new ways to trace matter and material processing at various scales – from the formation of presolar grains in dying stars through the mysteries of mixing and processing of materials in the solar circumstellar disk to the alteration of minerals on meteorite parent-bodies.

This keynote tries to provide a general introduction to nucleosynthetic anomalies in planetary materials and (with examples) will review the current state of-the-art for their application to obtain information on nucleosynthesis, dust processing, transport and (un-)mixing of material in the solar circumstellar disk, genetic relations of planetary bodies and parent body alteration.

[1] Lewis R.S., et al. (1987) *Nature* **326**, 160-162. [2] Dauphas N., et al. (2002) *APJ* **565**, 640-644. [3] Trinquier A., et al. (2009) *Science* **324**, 374-376. [4] Gannoun A., et al. (2011) *PNAS* **108**, 7693-7697. [5] Burkhardt C., et al. (2015) *this meeting* #**3475**.