

Is the solar system non-radiogenic Hf isotope composition uniform?

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The initial isotope composition of Hf in solar system materials provides valuable information about the early solar system and the evolution of planetary bodies. Degree and timing of global-scale silicate differentiation events on planetary bodies can be constrained by means of the long-lived ¹⁷⁶Lu-¹⁷⁶Hf decay system. However, this application requires a well-constrained initial ¹⁷⁶Hf/¹⁷⁷Hf and Lu/Hf of the bulk silicate portion of the respective planetary body. The bulk silicate portions of Earth and other planetary bodies are commonly assumed to have chondritic relative abundances and isotope compositions of refractory and lithophile elements. Therefore, the ¹⁷⁶Hf/¹⁷⁷Hf evolution of the bulk silicate portions of planetary bodies is assumed to be identical to that of chondrites. In light of recent reports of nucleosynthetic anomalies in other refractory and lithophile elements in bulk meteoritic materials, [e.g., 1, 2] we initiated a study to test for such variations in the non-radiogenic stable Hf isotope composition of different solar system materials. The assumption of a chondritic ¹⁷⁶Hf/¹⁷⁷Hf evolution of the bulk silicate portions of planetary bodies might not be valid if there was significant primary variability in non-radiogenic stable Hf isotope compositions. To test for such variability, we measured the Hf isotope compositions of terrestrial rocks and chondrites. We found no evidence for r- and s-process nucleosynthetic heterogeneity [3]. Here, we extend our data set to include differentiated meteorites.

Thirty replicate MC-ICP-MS analyses of a terrestrial basanite performed during multiple measurement sessions yielded an external reproducibility (2 s.d.) of 20- and 29 ppm for ¹⁷⁸Hf/¹⁷⁷Hf and ¹⁸⁰Hf/¹⁷⁷Hf, respectively (ca. 45-80 ng of Hf measured per analysis). Instrumental mass bias was corrected using ¹⁷⁹Hf/¹⁷⁷Hf. Our preliminary mesosiderite data show no *resolvable* r- and s-process heterogeneity in the stable, non-radiogenic isotopes of Hf. Thus, the effect of such heterogeneity on measured ¹⁷⁶Hf/¹⁷⁷Hf values is limited to ~70 ppm, including the error introduced by assuming ¹⁷⁹Hf/¹⁷⁷Hf = 0.7325 for the mass bias correction.

[1] Leya *et al.* (2008) *EPSL* **266**, 233 – 244. [2] Andreasen & Sharma (2007) *ApJ* **665**, 874 – 883. [3] Sprung *et al.* (2008) *GCA* **72**, A889.

Natural ferrous chamosite- A marine clay for protection and drug molecules synthesis

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Naturally occurring nano-crystalline Ferrous Chamosite, a marine clay with particle size of the order of 50 – 200 nm was collected from the quaternary marine sediments deposited near Kudiamozhi, Tuticorin District, Tamil Nadu and found to have chemical composition Fe²⁺₃[Fe²⁺₂Al][Si₃AlO₁₀] [OH]₈ by X-ray fluorescence (XRF). Interlayer spacing were found to be varying from 3 to 10 Å, showing that the distribution of the iron cationic species within the particles is inhomogeneous.[1]

Nanoclays are highly reactive and have been known to interact with a variety of organic molecules through electrostatic interactions, secondary bonding or covalent bonding to produce compounds that have found uses in a variety of industrial applications. Acylation of alcohols and amines is one such application which is of enormous interest in organic synthesis as it provides a useful and efficient protection protocol in a multistep synthetic process in the synthesis of drugs like aspirin, nitroglycerine, chloramphenicol and sulphanilamides apart from the protection of –OH and –NH groups. This reaction also has biological significance because of the presence of alcoholic hydroxyl and amino groups in a variety of biologically active compounds that necessitates the manipulation of the chemical reactivity of these functional groups during the synthesis of multifunctional synthetic targets possessing one or more of these groups. It is found that chamosite serves as an efficient and reusable, heterogeneous catalyst for the acylation of arylalkyl alcohols and amines.

[1] Sreedhar *et al.* (2009, in press) *Applied Clay Science* **43**.