I-Xe and Pb-Pb ages of Richardton chondrules

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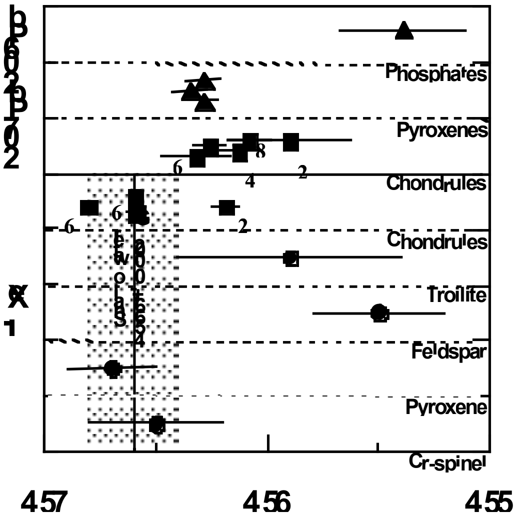
The Richardton (H5) chondrite is characterised by a low degree of chondrule-matrix integration. Although metamorphism affected the Rb–Sr distribution in Richardton, it had negligible effect on the major element chemistry or the texture of its chondrules (Evensen et al., 1979). I–Xe studies of Richardton may, therefore, provide insight into earliest stages of metamorphism on the Richardton parent body.

Each of the eight Richardton chondrules analysed was divided into few fragments, one mounted in epoxy and polished for mineralogical studies. Fragments from 4 chondrules were irradiated for I–Xe analysis; other fragments were used for Pb–Pb studies.



New I–Xe and Pb–Pb data are shown in the figure as squares, previous I–Xe ages of mineral phases (Pravdivtseva et al., 1998) as circles and Pb–Pb as triangles. Chondrules are identified by number. Two chondrules (#2, #6) have been successfully dated by both chronometers. Absolute I–Xe and Pb–Pb ages in Richardton chondrules are generally in good agreement (to within the uncertainty of the Acapulco normalization). However, the systematic difference is suggestive that absolute I–Xe ages *may* be 2–3 Ma too old. Our attempt to refine the absolute I–Xe age normalization by Pb–Pb dating of Shallowater (internal I–Xe standard) failed due to its extremely low uranium content (<2ppb). Supported by NASA grant NAG5-9442.

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Uptake of $(Cd^{2+})_{aq}$ by biogenic and abiogenic aragonite: a comparison with sorption onto calcite

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While numerous studies have provided valuable information on the removal of cadmium from solution by interaction with calcite, little is known about the sorption of this metal onto aragonite. Due to its metastability under Earth's surface conditions, aragonite tends to transform into calcite by reaction with aqueous solutions, and a number of low-temperature experiments have been directed to investigate the effect of some ions on this solvent-mediated transformation (Bötcher, 1997). However, the studies of metal-sorption onto aragonite focussed on environmental problems are rare. Here, we examine the uptake of Cd^{2+} by aragonite and calcite in a compartive way. The study is carried out for both biogenic and abiogenic carbonates, in order to evaluate the sorption rate on materials textured in different ways.

It is generally admitted that long-term Cd-uptake by calcite occurs via surface precipitation of a Cd-bearing solid-solution (Tesoriero and Pankow, 1996; Chiarello et al., 1997) even when Cd^{2+} is present at trace levels, due to the strong tendency of this ion to partition into calcite. Therefore, this study is focussed on the surface precipitation mechanism of removal of Cd^{2+} from solution, combining a conventional macroscopic study with qualitative sorption experiments achieved in a silica hydrogel medium. The gel yields a drastic decrease in the surface nucleation density, which allows obtaining precipitating individuals that are large enough to be observed and analysed in a scanning electron microscope. In this way, we have determined the nature and composition of the sorbate nuclei and their crystallographic relations to the substrate. The study is completed using glancing-incidence X-ray techniques to characterize the overgrowing precipitates (structure, thickness, and spatial distribution) at different stages of the process. The results indicate that Cd-uptake on aragonite occurs by surface precipitation of a calcite-type $(Cd,Ca)CO_3$ solid-solution. The total sorption capacity of aragonite seems to be significantly higher that that of calcite, which can be explained in terms of substrate-overgrowth configurations.

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