Rare earth element analysis of UR CAIs in CV3 chondrites by SRXRF

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Ca,Al-rich inclusions (CAIs) are characterized by volatility-fractionated rare earth element (REE) patterns (group I–VI) [e.g., 1,2]. CAIs with group II REEs are depleted in the most refractory [ultrarefractory (UR)] REEs and enriched in the less refractory REEs. The group II REEs resulted from condensation in a gaseous reservoir from which UR REEs were removed either by condensation or incomplete evaporation [3]. Little known about the specific mineral carriers of UR REEs. Therefore, CAIs with UR REE patterns, complementary to those with group II REEs, could provide important information on these carriers [4–7].

Here we report on REE patterns in individual minerals of three CV CAIs containing abundant very refractory Zr,Sc,Y-rich oxides and silicates, *Al-2, 33E-1,* and *3N-24* [9,10], measured with synchrotron radiation X-ray fluorescence spectrometry (SRXRF). The REE patterns in these CAIs have a strong UR trend for all measured phases, with heavy REEs strongly enriched over light REEs. Unique carrier phases of UR patterns were not identified, but are presumed to be Zr,Sc,Y-rich minerals. As consequence we infer that all constituents of single UR CAIs originate in the same solar nebula region possibly by condensation.

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