Do glasses in achondritic meteorites share a common source?

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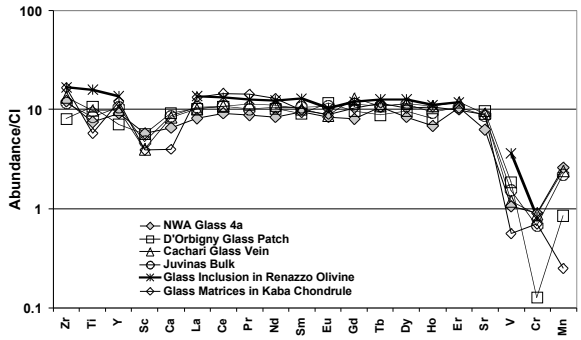
Howardites, eucrites and diogenites are breccia achondrites and are widely believed to be impactites from a parent body [1-3]. Howardites and eucrites also contain glass objects with major element chemical compositions that are similar to those of their respective bulk rocks – an apparent support of this belief. The recently discovered howardite NWA 1664 has abundant glass objects that are heterogeneous in their major and minor element abundances [4]. They range in composition from the Mg-rich Bununu group to the Fe-rich eucrite group and have very high K_2O contents (up to 1.2 wt%). This suggests individual formation and processing of the glass objects [4] similar to what happened to chondrules of chondrites rather than simple mixing and (shock) melting of anorthite+pyroxene. In contrast to the major elements, refractory lithophile trace element (TE) abundances in glass objects are unfractionated at 10 x CI (Fig.). They obviously signal a common homogeneous source that had chondritic relative TE abundances. Furthermore, abundances of TEs in glasses from NWA 1664 are similar to those in glasses from the eucrite Cachari and the angrite D'Orbigny and to the bulk eucrite Juvinas [5].



The very similar refractory TE abundances in glasses of howardites, angrites and eucrites likely indicate derivation from a common source. Achondrite glass objects share this feature with Ca,Al-rich glasses from glass inclusions in olivines of carbonaceous chondrites (Fig.) [6-8]. Consequently, all these glasses seem to have a common source with chondritic relative abundances of refractory TEs. Deficits in moderately volatile elements signal vapor-liquid fractionation.

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