

## Comparison of Metasomatic Features of CAIs in CV Chondrites with Terrestrial Meta-Igneous Rocks

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Many Ca-Al-rich inclusions (CAIs) in Vigarano-like carbonaceous (CV) chondrites exhibit mineral replacement textures reminiscent of metasomatic alteration in terrestrial igneous rocks. The primary minerals of CAIs form by a combination of condensation, evaporation, melting and crystallization at high temperatures (>1400 K) in the solar nebula and preserve the oldest ages that have been determined for rocks of our solar system [1,2]. CAIs were subsequently accreted with other components of chondrites into planetesimals, where they underwent fluid-assisted metamorphism [3,4]. Type B CAIs have coarse-grained primary minerals (100s of  $\mu\text{m}$  across), allowing clear textural distinction of secondary veins and replacement features.

In the CV3 Allende, secondary features include: (1) replacement of primary melilite by fine-grained sodalite, nepheline, Fe-bearing spinel, and laths of dmisteinbergite [5]; and (2) grossular-rich veins that extend into the CAI interiors [3]. The secondary rim formed during metasomatic introduction of Na, K, Cl and Fe into the CAIs and loss of Ca. The grossular-rich veins are dominated by Ca-Al-silicates, such as grossular, monticellite and wollastonite, consisting of elements that also occur in neighbouring primary minerals. However, mass balance calculations suggest that some Ca was lost from the CAIs during vein formation. Most textural replacement occurs in primary melilite, leaving primary anorthite only weakly altered.

The alkali-FeO alteration of the CAI rims and grossular-rich veins extending into CAI interiors share a similar geometry (although on a different scale) with subgreenschist to greenschist facies metamorphosed pillow basalts of the Slate Creek Complex (SCC), California, USA. In the SCC pillow rims, relict pyroxene and feldspar phenocrysts are replaced by fine-grained chlorite and muscovite, respectively [6]. Epidote-rich veins extend into the pillow interiors, where relict pyroxene is preserved and feldspar has been albitized.

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