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Accessory Ca-phosphates: major hosts for halogens and REE in meteorites

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Apatite and merrillite are accessory phases in numerous meteorite classes and exhibit diverse abundances and grain sizes. They are major carrier phases for REEs and halogens (F, Cl, Br, I). Intensive search with EPMA and SEM established a petrographically and chemically well-documented pool of Ca-phosphates in various meteorite classes. Stable $\delta^{37}\text{Cl}$ and halogen concentrations of selected grains were measured using a Cameca IMS 1280. The $\delta^{37}\text{Cl}$ values of most meteorite groups (e.g. acapulcoites, ordinary chondrites,...) are narrowly spread at $-0.05 \pm 1.20 \text{ ‰}$ (2σ), consistent with results from [1]. Apatites in eucrites exhibit highly variable isotope values from $-4.49 \pm 0.33 \text{ ‰}$ to $+11.93 \pm 0.33 \text{ ‰}$, similar to lunar samples [2]. Thus, the mechanisms leading to extreme Cl isotope fractionation may have been similar on the eucrite parent body and the Moon. Further analyses by LA ICP-MS and SIMS of individual phosphates in different meteorite classes are planned to constrain systematic variabilities of Cl isotopes and concentrations of halogens and REE.

[1] Sharp, Z.D. et al. (2007) Nature 446, 1062-1065.

[2] Sharp, Z.D. et al. (2011) Science 329,1050-1053.

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