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Crystal chemistry of hibonite as indicator for oxygen fugacity during solar nebula condensation

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The oxidation state of titanium in minerals present in chondrites has attracted considerable attention over the last years [1,2] due to the potential use as oxybarometer. We have studied hibonite grains from different carbonaceous chondrites, preparing them for TEM-EELS analysis by means of FIB. The EEL spectra acquired from natural samples were compared with those of synthetic hibonites prepared at different oxygen fugacities (fO_2). We have recently adopted a citrate-based sol-gel synthesis [3] which, compared to ceramic method, yields chemically more homogeneous samples and leads to the formation of crystal up to 90 μm . We have characterized such samples by means of EMPA, EELS and X-ray diffraction. Our recent results emphasise that, opposed to the common assumption, the $\text{Ti}^{3+}/\text{Ti}^{4+}$ ratio in hibonite does not depend solely on the fO_2 under which the CAIs has formed but it is strongly affected by the crystal chemistry, i.e. the presence of other elements, such as Mg.

[1] Ihinger P.D. *et al.* (1986) *EPSL* 78, 67. [2] Simon S. B. *et al.* (2007) *GCA* 71, 3098. [3] Cinibulk M. K. (1998) *J. Am. Ceram. Soc.* 81, 3157.

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