Coesite, some of its IR features (SiO_4 and OH), and dehydration

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Experimental

Coesite (Coe; grain size 30-80 μm) was synthesized (5 GPa, 1600 °C, 12 h) by using a cubic press [1]. Its unpolarized IR absorbance spectra were recorded on single-crystal plates with different thicknesses (the min is ~5 μm) by using a Nicolet iN10 MX IR Microscope. Similarly, IR spectra were also taken at room *P-T* on single-crystal plates annealled consecutatively at 200, 400, 600, 800, 1000 and 1200 °C, with every heating duration lasting for 24 h.

Result

The SiO_4 asymmetric stretching of Coe locates at ~1161, 1109, 1063, 1028 and 994 cm^{-1} whereas the SiO_4 asymmetric bending appears at ~838, 814 and 796 cm^{-1} [2].

~30(4) wt ppm H_2O occurs in the Coe. The OH peaks at ~3464, 3421, 3406 and 3377 cm^{-1} can be attributed to Type-II hydrogarnet substitution, and those at ~3500 and 3534 cm^{-1} to B-based defects [3].

In open air, the Coe grains starts to lose water at ~600 °C (27(5) wt ppm left), lose ~1/3 of the water at ~800 °C (22(6) wt ppm left), and lose ~2/3 of the water at 1000 °C (9(2) wt ppm left), implying a fast water diffusion.

Discussion

A quick response of the water content to the changes of *P*, *T* and composition is evident. It may facilitate the preservation of natural Coe in relevant geological processes. Water, readily released from coesite and other NAMs, may trigger partial melting as the subducted continental crustal material exhumes [4].

[1] Liu et al. (2012) *High Pressure Res* **32**, 239-254. [2] Liu et al. (2017) *JAES*, http://dx.doi.org/10.1016/j.jseaes.2017.03.016. [3] Koch-Müller et al. (2003) *Am Mineral* **88**, 1436-1445. [4] Zheng et al. (2011). *Earth Sci Rev* **107**, 342-374.