

Coesite inclusions in garnet from eclogitic rocks in western Tianshan, northwest China: Convincing proof of UHP metamorphism

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ABSTRACT

Coesite inclusions in garnet have been recognized in eclogitic rocks from western Tianshan, northwest China. The coesite grains exhibit distinct radial cracks in host porphyroblastic garnet; some coesite relics are well preserved, whereas others are partially replaced by quartz. Coesite has been identified optically and then confirmed by in situ Raman spectroscopy, showing the characteristic band at 522 cm⁻¹ and subsidiary bands at 428, 326, 271, 178, 151, and 121 cm⁻¹. The eclogitic rocks contain garnet, omphacite, and Na-Ca-amphibole, and they are rich in white mica (>30%) and graphite. Peak conditions of 570–630 °C and 2.7–3.3 GPa are constrained by garnet-clinopyroxene geothermometry and the occurrence of coesite. The presence of coesite and widespread quartz inclusions in garnet with radial cracks indicative of former coesite in these unique graphitic rocks confirms the previous suggestion of the UHP terrane for the western Tianshan, China.

Keywords: Coesite, UHP metamorphism, Raman spectroscopy, western Tianshan, China