Coesite-bearing eclogite in Henan Province, central China: detailed petrography, glaucophane stability and PT-path

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Abstract: The Triassic Qinling-Dabie collision zone between the Sino-Korean and Yangtze cratons in central China is segmented into 5 blocks by NNE-SSW trending faults. From east to west, they are: Su-Lu, Dabie, Hongan, Tongbai, and Qinling blocks. Coesite and its pseudomorphs have been described only in the Su-Lu and southeastern Dabie blocks. We have found new relict coesite and polycrystalline quartz pseudomorphs after coesite in eclogite garnet and kyanite at the northern end of the Hongan block. This establishes the existence of a narrow ultrahigh-P belt in the Hongan block. The coesite-bearing eclogites occur as 4-8 m thick layers in gneiss and are rich in Al2O3, MgO and SiO2 compared to common basalts. They have experienced at least four stages of recrystallization. The pre-eclogite stage I assemblage occurs as inclusions in cores of garnets and consists of garnet + katophorite/taramite + quartz + paragonite. The peak eclogite stage II assemblage is garnet + coesite + kyanite + omphacite + phengite + rutile ± talc ± glaucophane. Decompression stage III assemblage is garnet + quartz + omphacite + kyanite + phengite + paragonite + epidote + barroisite + ilmenite. Final retrograde stage IV assemblage consists of albite + hornblende ± Ca-clinopyroxene ± taramite/pargasite + quartz ± margarite + ilmenite. Porphyroblastic garnets show pronounced compositional zoning. Phase equilibria, geothermobarometers and a modified version of the GeO-Cale program were used to constrain P-T conditions for the four stages of recrystallization. The coesite-bearing eclogite shows a clockwise P-T path with a peak pressure of about 31 kbar at 620 ± 30°C. The coexistence of glaucophane with kyanite and omphacite and the existence of talc and omphacite inclusions in barroisite provides natural evidence of relatively high temperature and high pressure stability for glaucophane.

The ultrahigh-pressure (UHP) rocks of the various segments of the Qinling-Dabie suture have metamorphic ages of 210-230 Ma and supracrustal protoliths; they decrease in abundance and in peak metamorphic-temperature westward from 770°C in the Su-Lu block to 630°C for the Hongan block. The distribution of UHP rocks in the Dabie and Hongan blocks suggests that the Dabie block may have moved southward relative to the Hongan block about 30 km. The difference in the extent of exposures of ultrahigh- and high-P rocks in various blocks may have resulted from differential unroofing.

Key-words: coesite, glaucophane, talc, ultrahigh-P metamorphism, P-T path, Henan-China.

Introduction

Since coesite was discovered in the Dora Maira massif, western Alps by Chopin (1984) and in the western gneiss region (WGR) of Norway by Smith (1984), its occurrence in high pressure rocks has been increasingly recognized. At least seven ultrahigh-P eclogite terranes have been documented in the world; they all lie within continental collision zones in Eurasia and possess similar supracrustal protoliths (Coleman & Wang, in press) except for rare oceanic rocks in the Zermatt-Saas zone, western Alps (Reinecke, 1991).

In the long Triassic collision zone between the Sino-Korean and Yangtze cratons in central China, coesite has previously been identified only in the Su-Lu region (Hirajima et al., 1990; Zhang & Cong, 1991; Zhao et al., 1992; Wang et al., 1993; Zhang et al., 1994) and in a re-