ULTRAHIGH-PRESSURE MINERAL ASSEMBLAGES HIDDEN IN ZIRCONS FROM CORES IN THE MAIN DRILL HOLE OF CHINESE CONTINENTAL SCIENTIFIC DRILLING PROJECT

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The main drill hole of Chinese Continental Scientific drilling Project (CCSD-MH) is located at 34° 25' N, 118° 40' E near the village of Maobei, about 17 km SW of Donghai County, southwestern Sulu terrane. Up to now, the CCSD-MH has reached a depth of 5118.2 m and has penetrated five major lithologic units, including eclogite, amphibolite, ultramafic rock, paragneiss and orthogneiss unit. Because the amphibolite, paragneiss and orthogneiss have been overprinted by later amphibolite facies metamorphism, it is very difficult to determine the UHP mineral assemblages in these country-rocks of eclogite. However, zircon, an accessory mineral, has been considered an excellent container for the preservation of UHP minerals. Mineral inclusions in zircon separated from paragneiss, such as garnet epidote bitotite two-feldspar gneiss and garnet biotite amphibole albite gneiss, were investigated in detail. Abundant coesite inclusions occur in zircons from 45 paragneiss samples. Most coesite-bearing zircons contain the following UHP mineral assemblages: coesite + phengite, coesite + garnet, coesite + jadeite + garnet + apatite and coesite + garnet + apatite. Zircons separated from 48 orthogneiss samples also contain coesite inclusions; the index UHP mineral assemblages are characterized by coesite + phengite, coesite + kyanite + apatite and coesite + kyanite + titanite. Zircons separated from 15 amphibolite samples contain abundant UHP mineral inclusions, including coesite + garnet + omphacite, coesite + garnet + phengite and coesite + omphacite + rutile. UHP mineral assemblages as inclusions hidden in zircons from 17 eclogite samples were also identified by laser Raman spectroscopy; these include coesite + garnet, coesite + garnet + omphacite + rutile and coesite + phengite + apatite. These characteristic UHP mineral inclusion assemblages preserved in zircons from eclogites are similar to those in zircons from amphibolites, and are also consistent with matrix assemblages of the same eclogites. These data indicate that the paragneiss, orthogneiss and amphibolites in CCSD-MH undoubtedly experienced UHP metamorphism, and their UHP peak-stage assemblages in the matrix were retrograded and completely replaced by amphibolite-facies assemblages related to the rapid exhumation of the Sulu terrane.

Our studies show that coesite-bearing UHP mineral assemblages occur in zircons of eclogite and its country-rocks in CCSD-MH. Similarly, zircons separated from outcrops distributed in southwestern Sulu terrane, including gneissic rocks, quartzite, marble, schist and amphibolite also contain abundant coesite-bearing UHP mineral inclusions. Such consistent observations suggest that eclogite together with its country-rocks experienced in situ UHP metamorphism.