The Weihai migmatitic gneiss in the Sulu ultra-high pressure (UHP) metamorphic terrane, eastern China, was suffered from partial melting during its exhumation. The primary partial melt experienced a decompressional fractional crystallization (DFC) process to produce plagioclase (Pl)-rich leucosome crystallized at the high pressure eclogite-facies to granulite-facies condition and K-feldspar (Kfs)-rich pegmatitic vein crystallized at the amphibolite-facies retrogression. It is generally accepted that the fractional crystallization process without assimilation could not change the Sr-Nd-Hf isotopic compositions. In this study, we demonstrate that, (1) the DFC process might cause the decoupling between the whole-rock Sr and Nd isotopes. The Pl-rich leucosome almost has same $\varepsilon_{\text{Nd}}(t)$ value (-10.4 to -15.0) and initial (87Sr/86Sr) ratio (0.708173-0.712476) with the melanosome. The Kfs-rich pegmatitic vein has relatively homogeneous $\varepsilon_{\text{Nd}}(t)$ value (-14.8 to -15.2) but significantly high initial (87Sr/86Sr) ratio (0.713882-0.716284). (2) The DFC process could change the zircon $^{176}$Yb/$^{177}$Hf and $^{176}$Lu/$^{177}$Hf isotopic ratios, but could not affect the zircon $^{176}$Hf/$^{177}$Hf ratio and the $\varepsilon_{\text{Hf}}(t)$ values. Zircon $^{176}$Yb/$^{177}$Hf and $^{176}$Lu/$^{177}$Hf ratios are dramatically increased from the Pl-rich leucosome to the Kfs-rich pegmatitic vein. Zircon $^{176}$Hf/$^{177}$Hf ratio (0.282330±0.000017 for the Pl-rich leucosome, 0.282321±0.000026 for the Kfs-rich pegmatitic vein) and $\varepsilon_{\text{Hf}}(t)$ value (-10.9±0.6 for the Pl-rich leucosome, -11.6±0.8 for the Kfs-rich pegmatitic vein) are nearly unchanged between them. In consideration of the Late-Triassic alkaline complexes in the eastern Sulu UHP metamorphic terrane, we suggest that the extracted Kfs-rich felsic melt metasomatized the overlying mantle wedge resulting in syn-exhumation magmatism.

Key words: Migmatitic gneiss; Decompressional fractional crystallization; Decoupled isotopic compositions; Syn-exhumation magmatism; Sulu UHP metamorphic terrane

References


