

Petrology, geochemistry and metamorphic evolution of metamorphic rocks in Diancang Shan-Ailao Shan metamorphic complex belt, Southeastern Tibetan Plateau

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Combined study of petrology, geochemistry and metamorphism of meta-sedimentary rocks and meta-basic rocks, provide clear evidence of metamorphic evolution of Diancang Shan-Ailao Shan metamorphic complex belt. Detailed geochemical analysis in the meta-sedimentary rocks and amphibolites suggest the protoliths of claystone, siltstone, graywacke and island-arc basaltic rock, respectively. Microprobe and mineral inclusions analysis reveals that garnet porphyroblasts in meta-sedimentary rock bear a chemical composition zonation from core to rim. On the basis of paragenesis, mineral transformation and chemical composition zonation of garnets, four metamorphic stages have been recognized, i.e. early prograde metamorphic stage (M_1), peak amphibolite-granulite facies metamorphic stage (M_2), near isothermal decompression retrogression metamorphic stage (M_3), and late amphibolite facies retrograde stage (M_4). The paragenesis of Grt + Pl + Ms + St \pm Ky \pm Bt \pm Kfs + Qz (meta-sedimentary rocks), which formed at 560 ~ 590°C and 5.5 ~ 6.3 kb, is regarded as the M_1 stage mineral assemblage. The typical mineral assemblage of M_2 stage, which constrains P - T condition of 720 ~ 760°C and 8.0 ~ 9.3 kb, contains Grt + Bt + Ky/Sil + Pl + Qz or Grt + Bt \pm Sil + Pl \pm Kfs + Qz (meta-sedimentary rocks) and Grt + Cpx + Pl (meta-basic rocks). The paragenesis of Grt + Bt + Sil + Pl + Qz (meta-sedimentary rocks) and Hbl + Pl \pm Cpx \pm Bt \pm Qz (meta-basic rocks) defines M_3 stage mineral assemblage, occurring at P - T condition of 650 ~ 760°C and 5.0 ~ 7.3 kb. Newly formed intersectional biotite and muscovite, together with the rim of garnet, define the M_4 stage mineral assemblage of Bt + Ms + Pl \pm Kfs \pm Grt + Qz (meta-sedimentary rocks), inferred at 553 ~ 613°C. The metamorphic complex, record a clockwise metamorphic P - T trajectory characterized by near isothermal decompression. The integrated clockwise P - T path established for metamorphic complex in Diancang Shan-Ailao Shan metamorphic complex belt is a potential record of geodynamic process related to subduction-collision-exhumation between Indian and Eurasian plate.

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Zircon U-Pb-Hf-O isotopes and REE constrains on the origin of Mesozoic ore-bearing high Mg# adakitic rocks from Ningzhen area of east China: Petrogenesis and tectonic implications

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Cu-Mo-Fe mineralized high Mg# adakitic porphyries intruded in the eastern Lower Yangtze River Belt (LYRB), but the timing and petrogenesis of these adakites are not well constrained. In this study, five samples were collected from the ore-bearing adakites (Anjishan Cu deposit, Tongshan Cu-Mo deposit and Xiangshan Fe deposit) of Ningzhen region, in order to precisely constrain their formation ages, petrogenesis and tectonic settings. Zircon U-Pb ages dated by LA-ICP-MS show that ore-bearing adakite in Ningzhen region are about 110-118 Ma, obviously younger than ore-bearing adakites (140 \pm 5Ma), bimodal volcanic rocks with A-type granites (126-131Ma) along the LYRB. Magmatic zircon Ce⁴⁺/Ce³⁺ of adakites ranges from 4-1615, compatible to those from the older adakites in LYRB. Zircon Hf and O isotopes from Ningzhen adakites show a wide range from -10.58 - -23.35 and 5.74-7.03‰, respectively, fall between those of the LYRB and South Tan-Lu fault zone (STLF). Zircon Ti-thermometry of Ningzhen adakites range from 550-700 °C, averaged at 650 °C, similar to those from the LYRB too. Zircon O-Hf-Ce⁴⁺/Ce³⁺ and Ti-thermometry from the Ningzhen ore-bearing porphyries show their magma source may from an oxidized water-rich sources with continental crust involvement. Genesis of adakites in Ningzhen region is best explained by assimilation between metasomatized mantle and lower continental crust and followed by fractional crystallization. Combined with published ages data of ore-bearing adakites from the LYRB, Mesozoic magmatic activities from LYRB show a younging trend from inland to outland. A slab flat subducting and rolling back evolution model of the LYRB is proposed in this study.