

Mechanism of metamorphic zircon growth in a granulite-facies quartzite, Adirondack Highlands, Grenville Province, New York

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ABSTRACT

Granulite-facies quartzites from the Adirondack Highlands (Grenville Province, New York) contain accessory zircon with ubiquitous metamorphic overgrowths. Detrital zircon cores are resorbed, preserve various internal zoning styles and inclusions, and have ages of 1.3 to 2.7 Ga. These ages constrain the timing of deposition of the protolith sandstone and suggest that the Adirondack Highlands were proximal or part of Laurentia during deposition. Metamorphic overgrowths formed in the quartzites during the Shawinigan orogeny (1.20–1.14 Ga). The average volume of overgrowths in eight samples ranges from 62–87%, with a positive correlation between zircon growth and feldspar content (melt productivity during metamorphism). Melt volumes and Zr solubility were too small to allow the overgrowths to have formed in one dissolution-precipitation event. Crystal-size distributions suggest zircon coarsening by the dissolution of small crystals and Zr transfer via a partial melt, and thus zircon overgrowths date anatexis. These results have implications for provenance studies, as dissolution of small zircon grains and growth of new zircon could bias age spectra of metasedimentary rocks.

Keywords: Metamorphic zircon, quartzite, U-Pb geochronology, Ostwald ripening, Adirondack Highlands, Grenville Province