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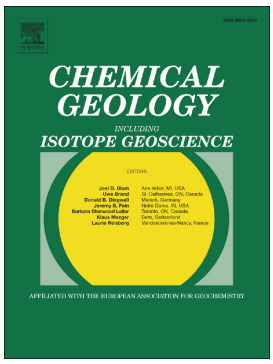

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The trace element and U-Pb systematics of metamorphic apatite

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Abstract

Apatite is a common accessory mineral in igneous, sedimentary and metamorphic rocks. It has potential as a provenance indicator in sedimentary systems, as it can host a wide variety of trace elements in its crystal structure and can yield thermochronological age information. However, the processes controlling the trace element and U-Pb systematics of metamorphic apatite remain poorly understood, and metamorphic apatite remains significantly under-represented in compositional provenance databases linking apatite trace-element chemistry to its corresponding parent rock type. We investigate the trace-element and U-Pb systematics of metamorphic apatite from a suite of 22 bedrock samples of diverse metamorphic grade and protolith type, sampled from a variety of metamorphic terranes. Metamorphic apatite from low- to medium-grade metapelites and metabasites can be easily distinguished from granitic apatite as it is significantly depleted in Th, REE, and Y. Depletion in Th and REE+Y is attributed to growth of co-genetic epidote, which is the dominant carrier phase of the REE+Y, Th, and U in all the low- to medium-grade samples mapped by laser ablation quadrupole inductively coupled plasma mass spectrometry (LA-Q-ICP-MS) and energy dispersive X-ray spectroscopy (EDS). Apatite U contents in low- to medium-grade metapelites and