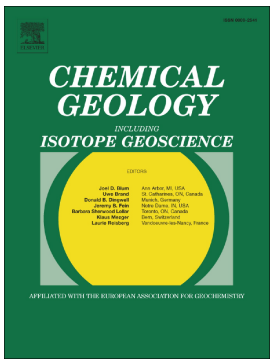

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Mineral Inclusion Assemblage and Detrital Zircon Provenance

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Abstract

Mineral inclusions are common in magmatic zircon and a potentially rich source of petrologic information. Controls on the relative proportions of inclusion phases, specifically early-crystallizing minerals such as apatite and late-crystallizing phases such as quartz, K-feldspar, and muscovite, have not been systematically studied. For instance, apatite dominates many magmatic zircon inclusion suites, and selective replacement of apatite over other phases has been proposed as a mechanism for generating apatite-poor inclusion assemblages in detrital zircons. However, the extent to which apatite inclusion abundance is influenced by source rock composition has not been established. The preservation of characteristic minerals in granite series, such as differences in magnetite and ilmenite abundances due to varying redox, have also not been systematically explored as inclusion phases in zircon. We surveyed zircon inclusion assemblages in Phanerozoic granitoids of a range of compositions and found a broadly inverse relationship between the presence of apatite in the inclusion suite and whole-rock SiO_2 content. Selective loss of apatite is evident from deficits in apatite content among inclusions in contact with cracks in both detrital zircons and some granitoid zircons with independent evidence for fluid ingress (i.e., secondary phases filling open cracks). In cases where microstructural