13 Oxygen Isotopes in Zircon

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INTRODUCTION

Isotopic and trace element analysis of zircons can provide reliable and robust estimates of age, compositions of coexisting minerals and melts, and constraints on the genesis and protoliths of host rocks. Recent technological developments facilitate analysis of oxygen isotope ratios in zircon with high accuracy and precision by laser heating/ gas-source mass-spectrometry and *in situ* from thin sections or grain mounts by ion microprobe/ secondary ion mass-spectrometer. A large number of studies have shown that non-metamict zircons preserve their $\delta^{18}O$ value from the time of crystallization; hence oxygen isotope ratio can be correlated with age (U-Pb) or trace element composition. The zircon $\delta^{18}O$ record is generally preserved despite other minerals that have been reset by high-grade metamorphism or intense hydrothermal alteration. Thus the refractory nature and robust inheritance of zircon offers a potential means to sort out magmatic equilibration and reequilibration, and post-magmatic alteration, an eternal problem for igneous rocks. New processes and interpretations for igneous events have been proposed when the effects of post-magmatic exchange are fully recognized. Crustal recycling can be recognized from magmatic values of $\delta^{18}O$(zircon), and if source rocks are igneous and young at the time of melting, $\delta^{18}O$ will often be the best geochemical signature.

1529-6466/03/0053-0013$05.00