Economic Geology
Vol 96, 2001, pp. 1671-1684

U-Pb Dating of Zircon and $^{40}Ar/^{39}Ar$ Dating of Biotite at Bingham, Utah

W. T. PARRY,
Department of Geology and Geophysics, University of Utah, Salt Lake City, Utah 84112-0111

PAULA N. WILSON,
Department of Geology and Geophysics, and Utah Museum of Natural History, 1460 East 135 South Room 719, University of Utah, Salt Lake City, Utah 84112-0111

D. MOSER,
Department of Geology and Geophysics, University of Utah, Salt Lake City, Utah 84112-0111

AND MATTHEW T. HEIZLER
New Mexico Bureau of Mines and Mineral Resources, Socorro, New Mexico 87801

Abstract

Uranium-lead dating of zircon and $^{40}Ar/^{39}Ar$ dating of biotite provide a new estimate of the age of the Bingham hydrothermal system. The U-Pb age of zircon from the Last Chance monzonite establishes the age of crystallization of this intrusion at 38.55 ± 0.19 Ma (2σ, MSWD = 2.08). The oldest hydrothermal event in the monzonite is dated at 38.40 ± 0.16 Ma and is based on a $^{40}Ar/^{39}Ar$ determination plateau age of primary igneous biotite. This age is indistinguishable from the U-Pb zircon age of emplacement of the monzonite. Petrographic and fluid inclusion data show that the biotite-bearing sample was propylitically altered at ~400°C, which would reset the $^{40}Ar/^{39}Ar$ age within ~115 ka. Thus the concordance of the biotite age with the intrusion age of the monzonite suggests that propylitic alteration was essentially contemporaneous with monzonite emplacement. The $^{40}Ar/^{39}Ar$ ages from three hydrothermal biotites sampled within the 0.35 percent Cu isopleth in the monzonite overlap within uncertainty and indicate that potassic alteration in monzonite occurred at 37.57 ± 0.11 Ma. The youngest hydrothermal activity is identified from a biotite sample (37.07 ± 0.21 Ma correlation age) in potassically altered quartz monzonite porphyry within the central MoS_2 zone. Hydrothermal biotite within the Bingham deposit was produced over a time period of approximately 0.50 ± 0.32 Ma.