

THE GIANT MURUNTAU GOLD DEPOSIT: GEOLOGIC, GEOCHRONOLOGIC, AND FLUID INCLUSION  
CONSTRAINTS ON ORE GENESIS

A. R. WILDE,†

VIEPS, Monash University, P.O. Box 28E, Melbourne, Victoria, Australia

P. LAYER,

Geophysical Institute and Department of Geology and Geophysics, University of Alaska Fairbanks, Fairbanks, Alaska 99775-5780

T. MERNAGH,

Australian Geological Survey Organisation, GPO Box 378, Canberra, ACT 2601, Australia

AND J. FOSTER

Geodiscovery Group, P.O. Box 59, Sherwood, Queensland 4075, Australia

Abstract

We reinterpret the regional geologic setting of the giant Muruntau gold deposit and report new  $^{40}\text{Ar}/^{39}\text{Ar}$  isotope age determinations and a laser Raman microprobe analysis of fluid inclusions. New  $^{40}\text{Ar}/^{39}\text{Ar}$  isotope age determinations of hydrothermal sericite selvages to gold-stage quartz veins are in excellent agreement with older Rb-Sr dates on auriferous quartz veins. They suggest Triassic sericite formation at 245 and 220 Ma, some 30 m.y. later than subjacent felsic intrusions as defined by Rb-Sr data. These dates call into question the role of magmatic fluid, metal, and heat input. Indeed, the Rb-Sr pluton ages may be a reflection of hydrothermal activity rather than cooling from magmatic conditions.

The Muruntau deposit is situated adjacent to a major rift, which has been periodically active from the Devonian to the Tertiary and has accumulated a substantial thickness of chemical, volcanoclastic, and clastic sediments, including red beds and evaporites. We infer that the Muruntau deposit is so large because of the presence of a major source of reduced sulfur in these nearby evaporitic sediments, via thermochemical sulfate reduction. Some support for the role of reduced sulfur is provided by the presence of detectable  $\text{H}_2\text{S}$  in fluid inclusions from late-stage auriferous quartz veins. Reduced sulfur-rich fluids could have been focused into the depositional site along major northeast-trending structures, which have influenced rift-basin architecture as recently as the Jurassic. Oxidation could, therefore, be an important ore-precipitating mechanism. A change from early  $\text{CH}_4$ - to later syngold  $\text{CO}_2$ -dominant fluid inclusions may be an indication of this process.