Geophysical Research Abstracts
Vol. 14, EGU2012-6858, 2012
EGU General Assembly 2012
© Author(s) 2012

40Ar/39Ar dating of unusual minerals (tourmaline, K-richterite, yimengite, wadeite and priderite) and applicability to the geological record.

F. Jourdan (1), E. Thern (2), S.A Wilde (2), and L. Frewer (3)

(1) Western Australian Argon Isotope Facility, Curtin University, Perth, Australia (f.jourdan@curtin.edu.au, +61 8 9266 3153), (2) Department of Applied Geology, Curtin University. GPO Box U1987; Perth, WA 6845. Australia., (3) Diatech Heavy Mineral Services, Welshpool WA 6106, Australia.

One of the advantages of the 40Ar/39Ar technique is that it relies on the decay of K, one of the most abundant elements in the Earth's crust. As such, many minerals can be dated with this technique, with the corresponding age data reflecting either the emplacement age or a cooling age. Here we present robust well-defined 40Ar/39Ar plateau ages obtained on a suite of minerals with variable potassium concentration which, despite their potential to unravel numerous geological problems, have seldom been (if ever; e.g. priderite) analyzed using the 40Ar/39Ar technique.

Tourmaline: Multi- and single-grain aliquots of tourmaline were extracted from three sets of cross-cutting and stratiform quartz-tourmaline veins throughout the siliciclastic metasedimentary rocks of the Archean Illaara granite-greenstone belt, Western Australia [1]. Tourmaline samples yielded 9 plateau and 1 inverse isochron ages defining two distinct age populations of 2939 $\pm$ 11 Ma (P=0.64) and 2642 $\pm$ 16 Ma (P=0.50). Tourmaline deposits are a common occurrence in the geological record [e.g. 2], and the mineral may be useful in assigning minimum depositional ages (e.g. cross-cutting veins) and in dating hydrothermal fluid circulations, as well as its potential for use in detrital mineral studies.

Yimengite: This mineral is a K-oxide and has been recovered from the Turkey Well kimberlite pipe, Yilgarn Craton, Australia. We obtained two concordant well-defined 40Ar/39Ar plateaus with a mean age of 2128 $\pm$ 5 Ma (P=1.0) interpreted as the emplacement age of the Kimberlite. No excess Ar is present suggesting that this mineral can be used to date Kimberlite emplacement as a viable alternative to phlogopite, which commonly retains part of its mantle history [e.g. 3, 4] thus leading to uncertainties in assigning a precise age.

K-Richterite, wadeite and priderite: K-richterite is a K-bearing sodic amphibole, wadeite is K-Zr silicate and Priderite is a K-oxide. These minerals have been recovered from Wolgidee Hills Lamproite, Kimberley District, Western Australia. K-richterite and wadeite yielded four concordant plateau ages with a mean age of 17.48 $\pm$ 0.10 Ma (P=0.51) suggesting that both minerals record the emplacement age of the lamproite. Priderite results from the same intrusion will also be presented.

These results indicate that a wider range of minerals can be dated using the 40Ar/39Ar technique than was previously appreciated. In particular, the association of these minerals with alkali rocks offers a new opportunity in obtaining dates from samples where it is traditionally difficult to assign precise emplacement ages.

[1] Thern et al. Goldshmidt Conf. 2011, [2] Marschall & Song, Elements 2011, [3] Bulanova et al., Lithos 2004, [4] Hopp et al., Lithos 2009,