

National Argon Map: an AuScope Initiative

$^{40}\text{Ar}/^{39}\text{Ar}$ Geochronology Laboratory Sample Submission Form

This form must be completed and returned to Marnie Forster (Marnie.Forster@anu.edu.au) before any work can be commenced in the Argon Laboratories.

Person submitting samples: Ian T Graham
Affiliation: UNSW Sydney
Project Title: Hera intrusive events
Sample Number(s) (including IGSN if one exists): S285SC
Mineral separation required? Yes or No: No
Date submitted:

GEOGRAPHIC AREA/ PROVINCE/ BASIN : Lachlan Fold Belt, Cobar basin	
1:250k SHEET NAME: Nymagee Metallogenic	NUMBER: SI/55-2
1:100k SHEET NAME:	NUMBER:
LOCATION METHOD: (GPS: WGS84 / AGD66 / AGD84 / GDA94)	
ZONE:	
EASTING:	NORTHING:
LATITUDE: -32.110965	LONGITUDE: 146.32883

STRATIGRAPHIC UNIT FORMAL NAME *: Lower Amphitheatre Group
STRATIGRAPHIC UNIT INFORMAL NAME:
LITHOLOGY: Fine-grained turbiditic siltstones and sandstones

DRILLHOLE ID (if applicable):
PROSPECT (if applicable):
DEPTH FROM (metres):
DEPTH TO (metres):

* Stratigraphic Unit names can be searched and checked within the Australian Stratigraphic Units Database via the following link: <https://asud.ga.gov.au/>

Dating Objective

What is the geological question $^{40}\text{Ar}/^{39}\text{Ar}$ analysis will address?

The age of crystallisation of this intrusive and how this age compares to previously obtained U-Pb titanite and Ar-Ar muscovite ages. The age of these intrusive dykes is completely unknown.

What type of age(s) are expected? (e.g. magmatic crystallisation, metamorphism, fluid alteration/mineralisation, cooling, shearing etc):

Magmatic crystallisation

Mineral target(s) for dating:

K-feldspar (orthoclase)

Estimated $^{40}\text{Ar}/^{39}\text{Ar}$ age (e.g. Cenozoic, Mesozoic, Paleozoic, Proterozoic, Archean – provide estimated numerical age range if possible):

I would expect them to be in the range of 280-290 Ma.

Sample Information

Location description (e.g. a sample of x was collected from y, z km from abc town):

This sample was collected from a cross-cutting pegmatite dyke some 1.8 metres from the ground level on the 285 Level, cross-cut of the Hera mine, 5 km south of the town of Nymagee.

Lithological characteristics (rock description):

A relatively medium-coarse minimum melt composition (orthoclase-albite-quartz) granite pegmatite.

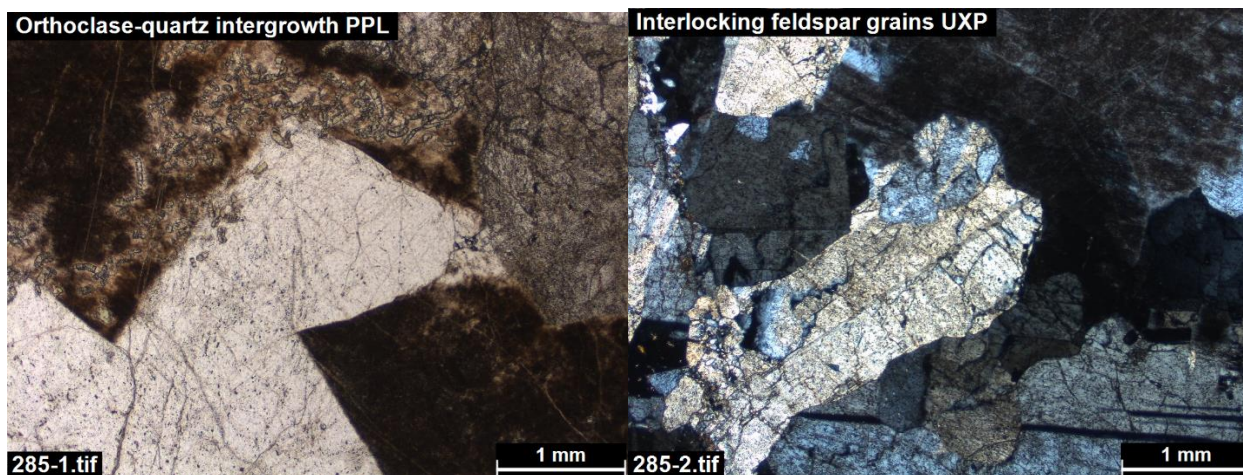
Relative age constraints (pertinent geological relationships with surrounding rock units and any previous geochronology):

Waltenberg et al (2019) obtained U-Pb titanite ages of 383.4 Ma and 382.5 Ma from cross-cutting quartz veins on levels 460 and 435 vent access respectively. Also, Downes and Phillips (2018) obtained an almost identical preliminary age of 382 Ma for muscovite intergrown with sulfides from the Far West orebody. The host rocks are some 419-407 Ma (MacRae, 1987).

Thin section description (if available):

In thin-section, this sample comprises coarse-grained interlocking grains of untwinned and perthitic K-feldspar (XRD analysis most closely matches orthoclase) with plagioclase (XRD analysis matches albite) and lesser quartz. Clinocllore occurs infilling micro-fractures but only in the albite and quartz (confirmed by SEM imaging and EPMA analysis).

Photograph(s) e.g. field site, hand-specimen, photomicrograph:



Relevant bibliographic references:

Chisolm, E.I.; Blevin, P.L.; Downes, P.M.; Simpson, C.J. *New SHRIMP U-Pb zircon ages from the central Lachlan Orogen and Thomson Orogen, New South Wales: July 2011-June 2012. Geoscience Australia Canberra Record 2014/32, Geological Survey of New South Wales Record GS 2013/1837 2014.*

David, V. *Structural setting of mineral deposits in the Cobar Basin. PhD thesis, University of New England, Armidale, NSW, Australia 2005.*

Downes, P.M.; Phillips, D. *⁴⁰Ar/³⁹Ar dating of three samples from mineralized zones in the Nymagee project area: preliminary results. Geological Survey of New South Wales Report GS2018/0164 2018.*

Fitzherbert, J.A.; Mawson, R.; Mathieson, D.; Simpson, A.J.; Simpson, C.J.; Nelson, M.D. *Metamorphism in the Cobar Basin: current state of understanding and implications for mineralization. Quarterly Notes 148, Geological Survey of New South Wales 2017.*

Glen, R.A. *Inverted transtensional basin setting for the gold and copper base metal deposits at Cobar, New South Wales. Austral. J. Geol. Geophys. 1991, 12, 13-24.*

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MacRae, G.P. *Geology of the Nymagee 1:100,000 Sheet 8033. New South Wales Geological Survey, Sydney 1987.*

McKinnon, A.R.; Fitzherbert, J.A. New developments at the Hera Au-Pb-Zn mine, Nymagee, New South Wales. *Austral. Institut. Geosci. Bull.* 2017, 67, 1-14.

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Skirka, M.; David, V. *Hera Au-Cu-Zn-Pb-Ag prospect, Nymagee, New South Wales. Exploration Field Workshop Cobar Region, CRC-LEME, Cobar* 2003.

Stegman, C.L. Eds.; *Geology, Landscapes and Mineral Exploration WA CSIRO Extended Abstracts, 2000*, pp. 113-116.

Sun, Y.; Jiang, Z.; Seccombe, P.K.; Feng, Y. *New dating and a review of previous data for the development, inversion and mineralization in the Cobar Basin. In Central West Symposium Cobar 2000; McQueen, K.G. and Waltenberg, K.; Blevin, P.L.; Hughes, K.S.; Bull, K.F.; Fitzherbert, D.E.; Cronin, D.E., Bultitude, R.J. New SHRIMP U-Pb zircon and titanite ages from the Lachlan Orogen and the New England Orogen, New South Wales. Geoscience Australia Record 2019/05 and Geological Survey of New South Wales Report GS2019/0409 2019*, pp. 58-70.