Sample 2 of 20: 41503

Person submitting samples: Dave Kelsey
Affiliation: Geological Survey of Western Australia
Project Title: Tectonism and Exhumation of the Paterson Orogen and East Pilbara Craton margin
Sample Number(s) (including IGSN if one exists): 41503
Mineral separation required? Yes or No: yes
Date submitted:

GEOGRAPHIC AREA/ PROVINCE/ BASIN : Gregory Range (Pilbara Craton)	
1:250k SHEET NAME: Nullagine	**NUMBER:** SF51-05
1:100k SHEET NAME: Braeside	**NUMBER:** 3155
LOCATION METHOD: (GPS: WGS84 / AGD66 / AGD84 / GDA94) GDA94	
ZONE: 51	
EASTING: 318600	**NORTHING:** 7652401
LATITUDE: *-21.22092000*	**LONGITUDE:** *121.25219000*

STRATIGRAPHIC UNIT FORMAL NAME *: Gregory Range Suite
STRATIGRAPHIC UNIT INFORMAL NAME:
LITHOLOGY: metagranitic rock (protomylonitic)

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 $^{40}Ar/^{39}Ar$ analysis will address?

What is the cooling/exhumation age from this sample? We are seeking to address whether the cooling age is related to the initiation or inversion of the Neoproterozoic Yeneena Basin, as the Gregory Range has many NNW-trending faults that are likely to be basin-bounding faults active at the time of Yeneena Basin initiation and/or inversion.

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

Cooling/exhumation.

Mineral target(s) for dating:

Hornblende

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

Mid- to Late-Neoproterozoic

Sample Information

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

WAROX database (field observations) site GSD041503.

Lithological characteristics (rock description):

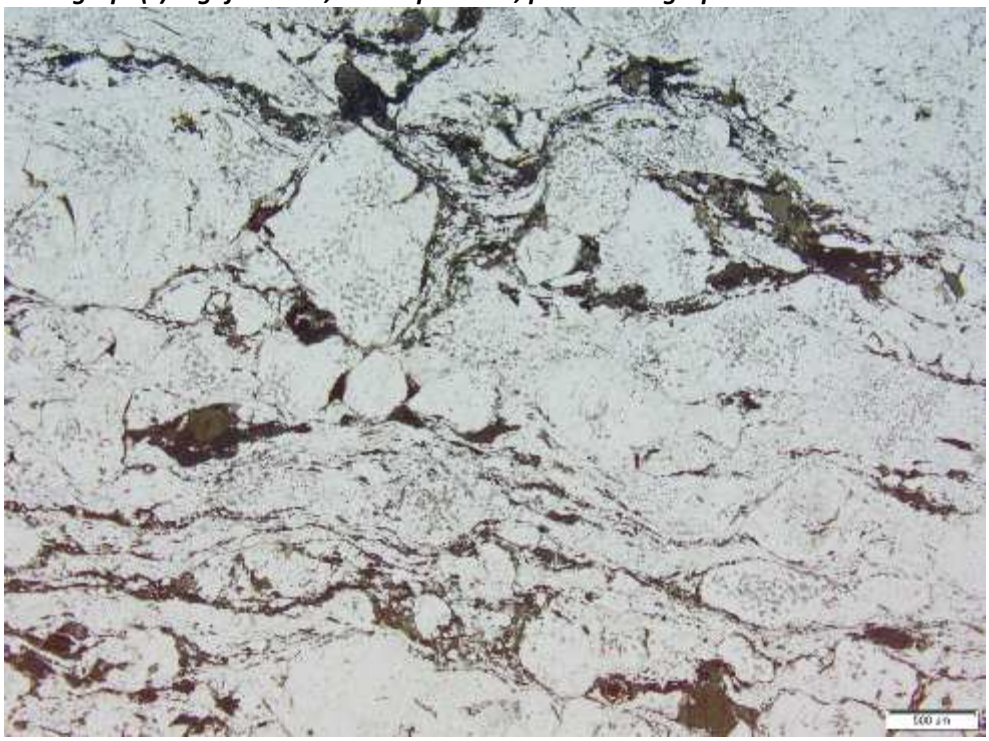
Protomylonitic metagranitic rock. Hornblende + titanite + microcline K-feldspar + biotite bearing.

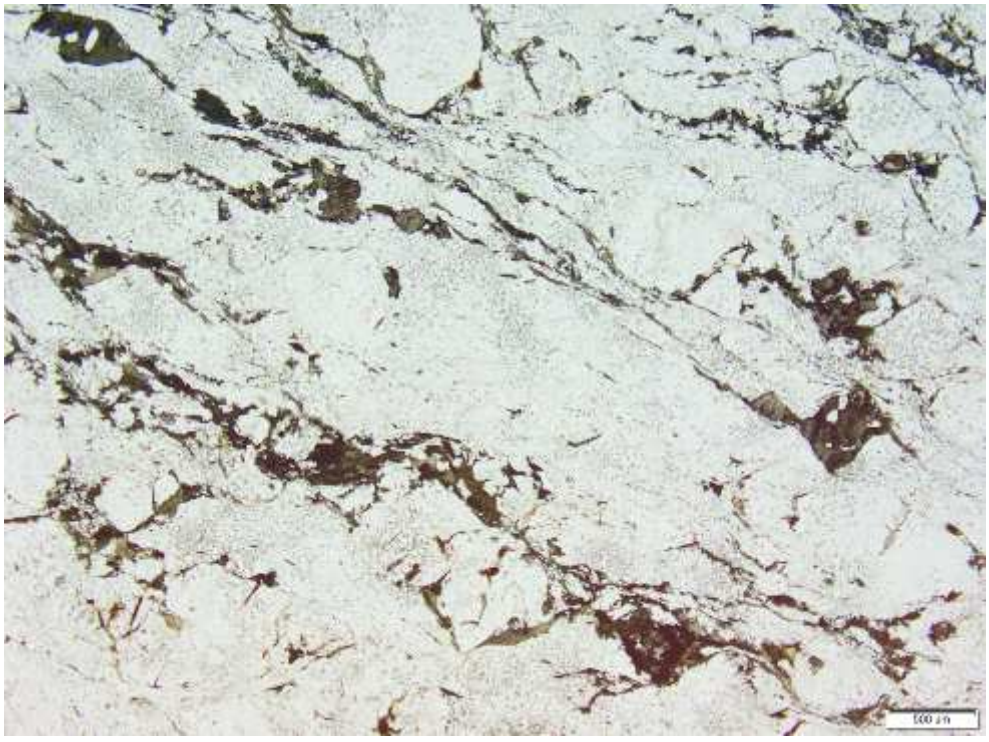
Relative age constraints (pertinent geological relationships with surrounding rock units and any previous geochronology):

Magmatic age is 2763—2757 Ma. Cooling/exhumation age is expected to be Neoproterozoic, corresponding to the Miles (c. 810 – 650 Ma) or Paterson (c. 550 Ma) Orogenies.

Thin section description (if available):
Porphyroclasts of K-feldspar, plagioclase and lesser hornblende in a matrix of quartz, K-feldspar, plagioclase, hornblende and biotite. Fabric is defined by strings/ribbons of strained quartz and aggregates of biotite and hornblende. The fabric is sufficiently intense for the rock to be a protomylonite. The rock is porphyroclastic and foliae of much finer-grained and dynamically recrystallised quartz and feldspar occur wrapping porphyroclasts as well as anastomosing through and around grains of 'intermediate' size (size between that of porphyroclasts and the finest-grained matrix material). The rock grain shape is seriate–interlobate. Porphyroclasts and grain aggregates of titanite are common.

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





The dots in the photos above are a combination of glue bubbles and poor polish and are not a reflection of weathering/alteration. The rock is fresh.

Relevant bibliographic references:

Williams, IR and Trendall, AF 1996, Braeside, WA Sheet 3155: Geological Survey of Western Australia, 1:100 000 Geological Series.
Williams, IR and Hickman, AH 2007, Nullagine, WA Sheet SF 51-16 (3rd edition): Geological Survey of Western Australia, 1:250 000 Geological Series.