

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: Joan Esterle
Affiliation: SCHOOL OF EARTH AND ENVIRONMENTAL SCIENCES, UNI QLD
Project Title: STRATIGRAPHY AND MINERALOGY OF CENOZOIC SEDIMENTS OVERLYING THE MORANBAH AND RANGAL COAL MEASURES
Sample Number(s) (including IGSN if one exists): 141135004-3
Mineral separation required? Yes or No: No
Date submitted: TBA

GEOGRAPHIC AREA/ PROVINCE/ BASIN : CENTRAL QUEENSLAND; BOWEN BASIN (SOUTH WALKER CREEK)	
1:250k SHEET NAME: BOWEN BASIN REGIONAL	NUMBER:
1:100k SHEET NAME: HARRYBRANDT	NUMBER: 8554
LOCATION METHOD: (GPS: WGS84 / AGD66 / AGD84 / GDA94) WGS84	
ZONE: 55	
EASTING: 651038	NORTHING: 7589712
LATITUDE: 21.789836° S	LONGITUDE: 148.461100° E

STRATIGRAPHIC UNIT FORMAL NAME *:
STRATIGRAPHIC UNIT INFORMAL NAME: Mafic intrusions
LITHOLOGY: Gabbro

DRILLHOLE ID (if applicable): BHP drillhole 141135
PROSPECT (if applicable): SOUTH WALKER CREEK MINE
DEPTH FROM (metres): 96.00
DEPTH TO (metres): 96.30

* 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 the mafic intrusions by absolute age dating

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

Mineral target(s) for dating: whole rock.

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

Sample Information

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

At South Walker Creek coal mine

Lithological characteristics (rock description):

Gabbro: fresh, medium to dark grey, faneritic, fine grained. Hydrothermal alteration observed on thin section, with few original textures remaining

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

Intrusive into Carboniferous sediments

Thin section description (if available):

The original mineralogy was olivine, plagioclase and augite, with accessory magnetite, some pyrite and possibly a late-cooling phase of apatite, however most of the original phases have undergone alteration to varying extents. Olivine in all samples has been altered to serpentine and talc before being pseudomorphed to calcite. Serpentinized olivine with accessory talc is still present in some samples, however most olivine phenocrysts have been pseudomorphed to calcite.

Sample 141135-003 had a 0.43% P₂O₅ content (0.188% P). This sample has undergone similar alteration to the previous higher-P samples, with the original augite phase altered to chamosite and some mild saussuritization of the plagioclase. However not all of the serpentinized olivine has completely pseudomorphed to calcite, with serpentine cores observed within numerous calcite crystals as well as some residual talc, suggesting the serpentinization process predates the calcite phase in the rock. Apatite crystals were observed in the groundmass with increasing density in proximity to calcite.

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



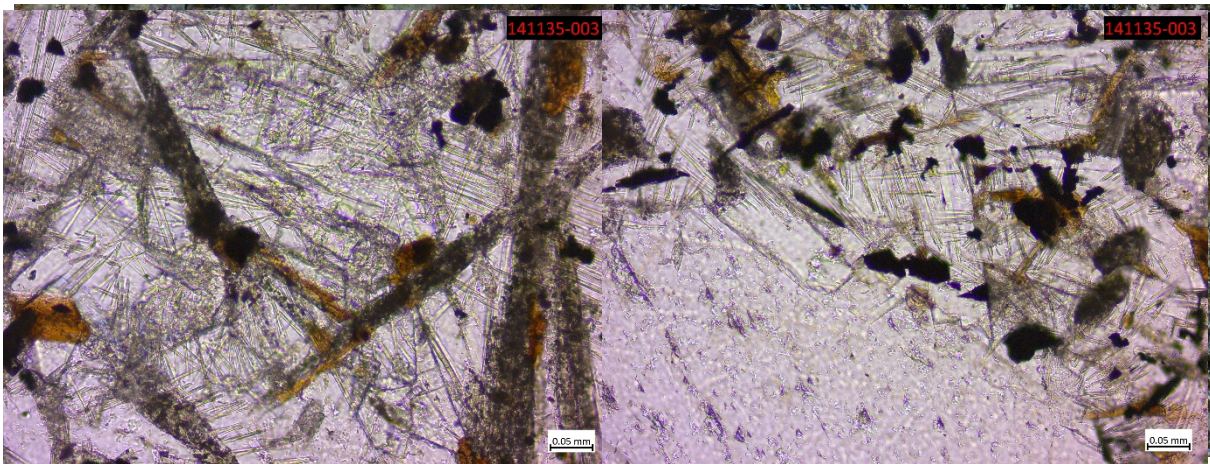


Figure 3: Apatite crystals in 141135-003

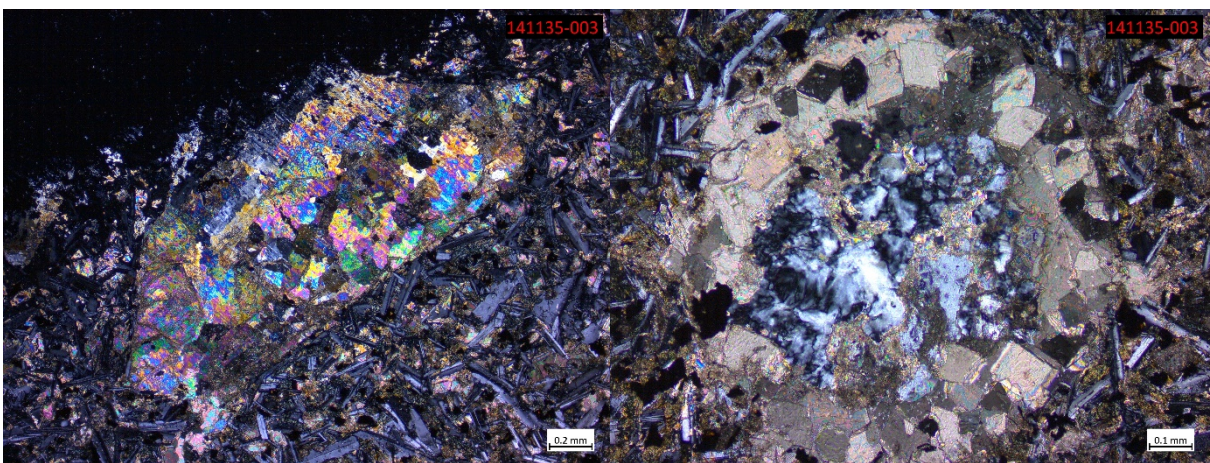


Figure 2: Olivine serpentinized with talc – core of a serpentinized calcite pseudomorph in 141135-003

Relevant bibliographic references:

Franks, Daniel. 2020. *Magmatic events in the South Walker Creek area and their relationship to coal mineralogy*. MSc thesis. University of Queensland.

Maunder, Bryden. 2020. *Mineralogy, geochemistry and geochronology of gouge material found in faults and fractures at the South Walker Creek coal deposit, Queensland*. Honours thesis. University of Queensland.