

Overview of Hole GT2A, ICDP Oman Drilling Project: Drilling middle gabbro in Wadi Tayin massif, Oman ophiolite

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Hole GT2A (UTM: 40Q 655960.7E / 2529193.5N) was drilled by the Oman Drilling Project (OmDP) into Wadi Gideah of Wadi Tayin massif in the Samail ophiolite, Oman. OmDP is an international collaboration supported by the International Continental Scientific Drilling Program, the Deep Carbon Observatory, NSF, IODP, JAMSTEC, and the European, Japanese, German and Swiss Science Foundations, with in-kind support in Oman from the Ministry of Regional Municipalities and Water Resources, Public Authority of Mining, Sultan Qaboos University, and the German University of Technology. Hole GT2A was diamond cored in 25 December 2016 to 18 January 2017 to a total depth of 406.77 m. The outer surfaces of the cores were imaged and described on site before being curated, boxed and shipped to the IODP drill ship Chikyu, where they underwent comprehensive visual and instrumental analysis. 33 shipboard scientists were divided into six specialized teams (Igneous, Alteration, Structural, Geochem, Physical Properties, Paleomag) to observe, describe, analyze the cores from Hole GT2A.

Hole GT2A drilled through the transition between foliated and layered gabbro. The transition zone occurs between 50 and 150 m curation corrected depth (CCD). The top 50 m of Hole GT2A is foliated gabbro whereas the bottom 250 m consists of layered gabbro. Brittle fracture is observed throughout the core. Intensity of alteration vein decreases from the top to the bottom of the hole. On the basis of changes in grain size and/or modal abundance and/or appearance/disappearance of igneous primary mineral(s) five lithological units are defined in Hole GT2A (Unit I to VI). Olivine gabbro is the most abundant lithology (65.4%). Grain size and modal layering present throughout and varies in thickness with most layers 0.5 - 30 cm (maximum thickness 130 cm). Dip of magmatic layering and foliation displays a shift around 150 m, below this the range of dip is more restricted. Brittle deformation structures are abundant in Hole GT2A, with 254 cataclastic zones and 190 fault zones logged. 20 main fault zones have been distinguished.

The uppermost part of Hole GT2A (Unit I) is dominated by fine-grained granular olivine gabbro accompanied by less dominant medium-grained granular olivine gabbro and rare coarse-grained varitextured gabbro. The lower part of Hole GT2A (Units II, III and V) is dominated by medium-grained granular olivine gabbro, olivine melagabbro and olivine-bearing gabbro. Modally-graded rhythmic layering with olivine melagabbro and olivine-bearing gabbro is well conspicuous in the bottom part of Unit II. The Unit VI occurs between 284.25 m and 293.92 m CCD from the top of the hole and is characterized by orthopyroxene-bearing lithologies such as fine-grained gabbro and coarse-grained troctolite. Discrete orthopyroxene crystals occur in these lithologies.

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