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Petrographical and geochemical characteristics of the sheeted dyke-gabbro transition zone in ODP/IODP Hole 1256D

M. Python (1), L. France (2), B. Abily (3), N. Abe (4), J.C. Alt (5), M.M. Godard (6), B. Ildefonse (6), J.H. Koepke (7), M.D. Kurtz (8), R. Oizumi (9), B.D. Payot (10), and the Exp. 335 Science Party Team

(1) Hokkaido University, Department of Natural History Sciences, Sappro, Japan (marie@earth.s.kanazawa-u.ac.jp), (2) CNRS-UPR 9046, Centre de Recherches Pétrographiques et Géochimiques, Nancy, France (lydextrem@yahoo.fr), (3) Observatoire Midi-Pyrénées, Laboratoire Géosciences Environnement Toulouse, Toulouse, France (benedicte.abily@gmail.com), (4) Japan Agency for Marine-Earth Science and Technology, Deep Sea Research Department, Yokosuka, Japan (abenatsu@jamstec.go.jp), (5) University of Michigan, Department of Geological Sciences, Ann Arbor, USA (jalt@umich.edu), (6) CNRS-Université Montpellier II, Géosciences Montpellier, Montpellier, France (marguerite.godard@um2.fr, benoit.ildefonse@um2.fr), (7) University of Hannover, Institut fuer Mineralogie, Hannover, Germany (koepke@mineralogie.uni-hannover.de), (8) Woods Hole Oceanographic Institution, Department of Marine Chemistry and Geochemistry, Woods Hole, USA (mkurz@whoi.edu), (9) Yamagata University, Department of Earth Sciences, Yamagata, Japan (halfway55232@msn.com), (10) Kanazawa University, Department of Earth Sciences, Kanazawa, Japan (saeko_00@yahoo.com)

During IODP Expedition 335, high grade granoblastic hornfels were extensively recovered as drilling cuttings at the gabbro-sheeted dyke transition zone of ODP Hole 1256D (East Pacific Rise, 6°44.163′N, 91°56.061′W). This lithology probably results from high-temperature metamorphism of previously hydrothermally altered diabases and/or basalts; the heat source likely stems from the melt lens located at the top of the magmatic chambers imaged along present-day fast-spreading ridges. This lithology, associated with gabbroic bodies, characterises the transition zone between the sheeted dyke complex and the uppermost gabbroic section, and represents the interface between magmatic and hydrothermal convecting systems in an oceanic crust formed at fast-spreading ridges. In this study, 14 samples from the junk basket (cuttings) and 2 samples from cores obtained during Expedition 335 were observed and analysed. The petrological and chemical characteristics of 5 granoblastic samples collected during Expedition 312 at the root of the sheeted dyke complex and between two gabbroic horizons were also acquired for comparison. Samples collected during IODP Expedition 335 are mainly fine grained oxide grabbronorites composed of two pyroxenes, plagioclases and oxides (ilmenite, magnetite) with more or less amphiboles, sulphides, quartz and accessory minerals. Orthopyroxene Shape (roundish or anhedral), the amount of oxide inclusions in clinopyroxene and plagioclase morphology (laths or *triple-junction* mosaic) indicate various recrystallisation degrees. Plagioclases show a strong zoning in the less recrystallised samples, which tend to disappear with increasing recrystallisation degree. Samples show usually low alteration (less than 10%) with moderate transformation of pyroxenes into talc or actinolite. Samples from Expedition 312 show finer grains, higher degree of alteration (up to 30%), and weaker recrystallisation. They are mainly composed of plagioclases, amphibole and oxides (ilmenite, magnetite) with more or less pyroxenes, quartz and alteration phases. Samples from the higher stratigraphic level (root of the sheeted dyke complex above the shallowest gabbro) are virtually free of pyroxenes while the strongly recrystallised samples from the bottom of the hole (i.e. closer to the gabbroic section) contain only episodic amphibole and are rich in pyroxenes. The composition of plagioclase ranges from An_{12} to An_{85}, with higher anorthite contents observed in the most recrystallised samples. Pyroxenes composition ranges from $Wo_{37}En_{46}Fs_{17}$ to $Wo_{46}En_{38}Fs_{16}$ for Cpx and $Wo_4En_{59}Fs_{37}$ to $Wo_2En_{65}Fs_{33}$ for Opx, and does not show any significant variation with the recrystallisation degree. Temperatures of recrystallisation were estimated between 902 and 980°C using the two-pyroxenes geothermometer. Heating and probable partial melting resulting from magmatic activity below hydrothermally altered sheeted dyke complex would lead to metamorphism and recrystallisation associated with light elements migration. This process would lead to variations in the modal composition of the rock and in the chemical composition of the minerals stable in hydrothermal and magmatic conditions.