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Shape and Crystallographic Preferred Orientations of Constituent Mineral Grains in the Pankenushi Gabbro Mylonite and Ultramylonite of Central Hokkaido, Japan

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The Pankenushi gabbro mylonite sample from the Hidaka metamorphic belt of central Hokkaido, Japan, contains porphyroclasts (grain sizes of 100∼1200 micrometers; 12 mode%) of Opx, Cpx and Pl in matrix of monomineralic Pl aggregate (grain sizes smaller than 150 micrometers; 65 mode%) and fine-grained polymineralic (Opx + Cpx + Hb + Qz + Bt + Ilm) aggregate (grain sizes smaller than 100 micrometers; 23 mode%) mainly derived from a decomposition reaction of Px's. Px porphyroclasts develop a strong SPO subparallel to lineation as well as a strong CPO such that their (100) planes are subparallel to foliation and [001] axes are subparallel to lineation. Monomineralic aggregate Pl grains exhibit a weak SPO anticlockwise oblique to foliation and a distinct CPO such that their (001) planes are subparallel to foliation and [1-10] axes are subparallel to lineation. Hb grains in the fine-grained polymineralic aggregate develop an SPO subparallel to lineation and a CPO such that their (100) planes are subparallel to foliation and [001] axes are subparallel to lineation. In contrast, Opx, Cpx and Qz grains in the fine-grained polymineralic aggregate show neither SPO nor CPO. The Pankenushi gabbro ultramylonite sample contains porphyroclasts (grain sizes of 75∼1200 micrometers; 5 mode%) of Opx and Cpx in matrix in which Opx, Cpx, Hb, Qz, Bt and Ilm grains (grain sizes smaller than 40 micrometers; 30 mode%) are scattered in Pl aggregate (grain sizes smaller than 75 micrometers; 65 mode%). Px porphyroclasts and matrix Pl and Hb grains develop SPOs and CPOs similar to those in the mylonite sample. In contrast to the mylonite sample, however, matrix Opx, Cpx and Qz grains exhibit weak SPOs and CPOs; (001) planes and [001] axes of orthopyroxene grains tend to align subparallel to foliation and lineation, respectively, while (10-10) planes and [0001] axes of quartz grains tend to align subparallel to foliation and lineation, respectively. The SPOs and CPOs of Px porphyroclasts and Pl grains in both mylonite and ultramylonite samples developed primarily by their crystal plastic deformation. Px and Qz grains in the fine-grained polymineralic aggregate of the mylonite sample lack SPO and CPO likely due to dominant grain boundary sliding of these reaction-derived grains. However, reaction-derived Hb grains develop both SPO and CPO. They are mostly euhedral or subhedral so that they may preserve an SPO and a CPO formed during their anisotropic growth. Constituent mineral grains of the fine-grained polymineralic aggregate are scattered and isolated in the ultramylonite sample so that isolated Px and Qz grains are crystal plastically deformed to develop SPOs and CPOs.