

Orbicular gabbro discovered from the Tono pluton, Kitakami Mountains, Japan

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Orbicular rocks, though rare and of local occurrence, have long captured attention of petrologists, owing to their spectacular texture. Investigation of orbicular rocks is of importance to understanding magmatic processes along the margins of the magma reservoir.

Orbicular gabbro is newly discovered from the 'western marginal gabbro' in the Lower Cretaceous Tono pluton, Kitakami Mountains, Japan. The orbicular gabbro generally occurs as weathered boulders of orbicules, which range from 50 to 150 mm in diameter. The orbicular gabbro may be divided into three different parts: (1) the cores of the orbicules; (2) the olivine gabbroic concentric shells; and (3) the quartz gabbroic matrix contains closely packed orbicule. The cores of orbicules show remarkable variation such as granodiorite, quartz gabbro, and hornblende gabbro. Some cores are similar to the quartz gabbroic matrix, and rarely inject through the concentric shell into the matrix. The concentric shell is characterized by radial arrangement of comb layered plagioclase, fan-shaped comb layered clinopyroxene, and rarely by slender curved branching plagioclase.

Vernon (1985) proposed a model for the igneous origin of orbicules that involves superheating of the magma followed by supercooling. The orbicules from the Tono pluton are considered to have formed in a water-rich part of the magma reservoir, where the magma was superheated and most crystals were resorbed. Pressure release related to intrusion to higher levels in the crust probably caused exsolution of water, leading to large degrees of undercooling, and may form orbicules.

