Electron channeling contrast imaging of individual dislocations in geological materials using a field emission scanning electron microscope

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Abstract

Imaging of individual dislocations in a field emission scanning electron microscope (FE-SEM) is currently under spotlight. Characterization of types of the dislocation and its density is commonly performed by the diffraction contrast method, bright field and dark filed imaging in a transmission electron microscope (TEM). Also, dislocation density can be measured by indirect methods such as dislocation oxidation and etching techniques in an optical microscope and a FESEM. Here, we report electron channeling contrast imaging (ECCI) of individual dislocations in deformed ferropericlase and forsterite. The bulk specimen was polished mechanically and chemically using colloidal silica particles. The polished surface was coated with amorphous carbon. The FESEM was operated at 20 kV-acceleration voltage. The backscattered electron images were obtained at a working distance less than 10 mm. The crystal orientations of the target grains were determined by electron backscatter diffraction. Under the Bragg conditions, ECCI can provide dislocation density and the character of dislocations the in the bulk specimen. The ECCI of dislocations in a bulk specimen has many advantages over TEM in a thin foil specimen.

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