SIT06-19 会場:104 時間:5月22日 15:45-16:00

Rheological behaviors of subducting oceanic crust: Implications from experimentally deformed blueschists

Rheological behaviors of subducting oceanic crust: Implications from experimentally deformed blueschists

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Investigations on deformation mechanism of blueschist can be helpful for delineating rheological behaviors of subducting oceanic crust. We deformed natural blueschists under pure and simple shear regimes using Griggs-type solid-medium apparatus and conducted fabric analyses of rock-forming minerals. Mechanical data of pure shear experiments display larger increase of yield stress at low confining pressure (0.5 to 1 GPa) rather than that at high confining pressure (1 to 2 GPa), implying that pressure-sensitive creep at low pressure (0.5?1 GPa) shifts to pressure-insensitive creep at high pressure (1?2 GPa). Microstructures of glaucophane and lawsonite deformed at simple shear experiments suggest that brittle fracturing are dominant at 1 GPa, but plastic flow of constitute minerals become important at 2.5 GPa. In addition, EBSD data indicate angle between slip plane and shear direction corresponding to angle of strain marker at 1 GPa and to angle of strain ellipsoid at 1.5?2.5 GPa. Our experimental data indicate, therefore, that deformations of glaucophane and lawsonite in the subducting oceanic crust are mostly controlled by brittle deformation at 1 GPa and ductile deformation at higher confining pressure (1.5?2.5 GPa); consequently, brittle-ductile transition zone likely occurs at ˜1.0?1.5 GPa in our experimental conditions.

キーワード: Blueschist, Glaucophane, Lawsonite, Griggs-type solid-medium apparatus, oceanic crust
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