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# Effects of morphology of minerals and adsorbed water on the friction in faults

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Friction among rocks and minerals is critical for understanding fault slip and landslide. The maximum friction coefficients of common minerals can be described by a constant value (0.85 for the normal stress $\sigma$ <200 MPa and 0.6 for $\sigma$ >200 MPa) [1]. However, certain mica and clay minerals have lower friction coefficients [1] and the friction coefficients were reduced under the presence of adsorbed water [2]. Since these mica and clay minerals are common constituents of fault-forming minerals, it is important for understanding the physics and chemistry of the low friction coefficients of these layered minerals.

Interlayer bonding energy (ILBE) of these layered minerals has been believed to have a linear relationship with the friction coefficients [2, 3]. However, this hypothesis is controversial due to the inconsistency of experimental results among researchers [4]. In this study, the ILBEs of several common mica and clay minerals were estimated by using the first-principles electronic state calculations for discussing whether the ILBE cited in the papers [2, 3] were correct or not. The hypothesis stands for that the major sliding plane should be localized on the flat (001) planes. This condition was discussed by comparing the sliding experiments of muscovite single crystal and powder samples.

Adsorbed water has been believed to have effects on the friction sliding by dry and humidity-controlled experiments. The effect of adsorbed water on the maximum friction was investigated by Morrow et al. (2000) [2]. However the direct evidence of the presence of adsorbed water was not obtained. In this study, the effect of adsorbed water on a muscovite surface was directly measured by using two salt solutions. The stability of adsorbed water was estimated by using the first-principles electronic state calculations.

In this talk, we discuss the factors describing the low friction coefficients of these layered minerals.

References

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