Abstract

The objective of this study is to experimentally determine the shear strength of fractures in Tak granite under elevated temperatures. Triaxial shear tests are performed using a polyaxial load frame. The effects of temperature on the peak shear strengths of tension–induced fractures and smooth surfaces are determined. The polyaxial load frame applies confining (lateral) stresses while the axial stress is increased. The axial load is applied at the rate of 1 MPa/s until a total displacement of 2 mm is reached. The specimens have nominal dimensions of 5.0×5.0×8.7 cm^3 and the fracture area of 5×10 cm^2. The normal of fracture plane makes an angle of 60° with the axial (major principal) stress. The testing temperatures range from 30°C (ambient temperature), 100°C, 300°C to 500°C with confining stresses from 1, 3, 7, 12 to 18 MPa. The results clearly show the thermal effect on the friction resistance of granite fractures. For rough fracture surfaces the higher the temperatures can lower the shear strength. This can be seen also from the reductions of the friction angle and cohesion with increasing temperature. The proposed exponential equation can be used to predict the friction resistances of the fractures under temperatures within the range tested here. The shear strength of smooth surface tends to increase with temperature particularly above 100°C. This may be due to stick–slip phenomenon. More testing is needed to assess the effects of facture roughness and mineral compositions on the fracture shear strength.