Quartz cleavage fracturing and subsequent recrystallization along the damage zone recording fast stress unloading

Strings of recrystallized grains along cleavage planes in host quartz crystals within pseudotachylyte-bearing breccias from the Silvretta basal thrust, Central European Alps, and within shocked gneisses from the Vredefort impact structure, South Africa, are compared and contrasted. The aim is to obtain the characteristic deformation and stress history during microfabric evolution. Strings of recrystallized grains occur in sets parallel to *r*- and *z*-rhombohedral planes of the host quartz in both localities and additionally along basal planes in Vredefort gneisses. In Silvretta fault rocks, they exclusively occur in quartz clasts within tensional domains associated with the propagating pseudotachylyte-related fault tip, indicating that cleavage occurred simultaneously with pseudotachylyte generation. Cleavage of quartz in Vredefort gneisses is related to shock during impact. Quartz cleavage fracturing along planes of minimum free surface energy is suggested to require fast unloading from high transient stresses, as realized in both geological settings: unloading from >400 MPa within minutes during faulting and from <20 GPa within milliseconds during impact. An additional influence of thermal shock caused by frictional heating is likely. Strain-free grains grew *in situ* along the damage zone surrounding the cleavage fractures at quasi-isostatic stress conditions after deformation and at sufficient temperatures to allow for static recrystallization of quartz.