Identification of a New Class of Deformation Bands

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Abstract

I describe for the first time the occurrence of deformation bands within a strike-slip tectonic setting within the Ocotillo Conglomerate, located in the San Felipe Hills, southern California, U.S.A. A conjugate set of over 35 strike-slip faults occur within the study area. They commonly are comprised of a fault core consisting of a network of coalesced deformation bands, and a surrounding damage zone, several meters thick, of more widely spaced deformation bands. In order to characterize the textural, physical, and chemical attributions of deformation band development, twenty-four samples of a distinctive marker bed transected by multiple deformation bands, and twelve samples of deformation bands were collected for detailed laboratory study. Average grain and bulk densities for the marker bed are relatively low (~2.67 and 1.6 g/cm^3 respectively). In contrast, grain and bulk densities for deformation bands are high (~2.74 and 2.1 g/cm^3 respectively). Average porosity for the deformation bands is low (22.9%) in relation to the marker bed (40.1%). Relative to the framework composition volumetric strain results show a loss of -24.7% ±7.1% for deformation band samples. Point counts and petrographic work of thin sections, reveal a reduction in pore space, abundant evidence for grain fragmentation and a reduction in grain size, and an increase in matrix. The matrix of deformation bands is composed mostly of illite and smectite-rich I/S expandable clays. Evidence presented herein indicates that shear bands within the Ocotillo Conglomerate are cataclastic in character and likely formed at depths ranging from 2.5-4.0 km during development of a conjugate strike-slip fault system. However, they are not the result of compaction during deep burial, and thus they represent a new class of deformation bands.