MICROSTRUCTURAL CONTROLS ON HYDRAULIC PROPERTIES OF DEFORMATION BANDS IN SANDSTONE

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Deformation bands in sandstone and other porous rock have been shown to act as barriers or baffles to fluid flow. Reduction in permeability within bands relative to host rock results from grain size reduction, preferred cementation, and entrainment of fines within bands. Permeability and capillary pressure properties of these bands are controlled by the geometry of flow pathways between pores. This study tests the hypothesis that the pore connectivity and pore throat geometry of deformation bands is a function of host rock composition (grain size, mineral composition), diagenesis, and deformation band kinematics (amount of slip, compaction accommodated by the band). I will employ newly developed argon ion milling techniques for sample preparation for scanning electron microscopy (SEM) imaging of submicron textures in deformation bands to assess difference in flow properties of bands of variable amount of slip and host rock composition. In a preliminary test conducted using ion beam milling to prepare a deformation band from the Entrada Sandstone of the San Rafael Desert, Utah, submicron-scale images of pore space and pore-filling cements were obtained, including euhedral quartz crystals that precipitated after band formation. Sample preparation by ion beam milling allows SEM imaging at submicron-scale resolution that is necessary to image pore connectivity and pore throat geometry in deformation bands that control fluid flow. These data can be used to assess the hydraulic properties of deformation bands in sandstone, and to evaluate impact to hydrocarbon recovery from reservoir rocks that contain deformation bands.

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