Deformation bands in sandstone: a review

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Abstract: Deformation bands are the most common strain localization feature found in deformed porous sandstones and sediments, including Quaternary deposits, soft gravity slides and tectonically affected sandstones in hydrocarbon reservoirs and aquifers. They occur as various types of tabular deformation zones where grain reorganization occurs by grain sliding, rotation and/or fracture during overall dilation, shearing, and/or compaction. Deformation bands with a component of shear are most common and typically accommodate shear offsets of millimetres to centimetres. They can occur as single structures or cluster zones, and are the main deformation element of fault damage zones in porous rocks. Factors such as porosity, mineralogy, grain size and shape, lithification, state of stress and burial depth control the type of deformation band formed. Of the different types, phyllosilicate bands and most notably cataclastic deformation bands show the largest reduction in permeability, and thus have the greatest potential to influence fluid flow. Disaggregation bands, where non-cataclastic, granular flow is the dominant mechanism, show little influence on fluid flow unless assisted by chemical compaction or cementation.