Geophysical Research Abstracts
Vol. 13, EGU2011-1456, 2011
EGU General Assembly 2011
© Author(s) 2010

Preferred cementation by iron rich dolomite along deformation bands in a hydrocarbon reservoir, Matzen, Austria

Jasmin Kaiser (1), Ulrike Exner (1), Susanne Gier (1), and Wolfgang Hujer (2)
(1) Department of Geodynamics and Sedimentology, University of Vienna, Austria, (2) OMV, LEP-FC, Gänserndorf, Austria

In porous sedimentary rocks, fault zones are frequently accompanied by deformation bands. These microstructures are tabular zones of displacement, where mostly grain rotation and grain fracturing result in a significant reduction of porosity.
Drill core samples (depth about 1650 m) were analyzed close to large normal faults from the most productive hydrocarbon reservoir in the Vienna Basin (Austria), the Matzen oil field. The Badenian terrigeneous sandstones contain predominately quartz, feldspar and dolomite as sub-rounded, detrital grains and are weakly cemented by Fe-dolomite.
Deformation bands occur as single bands of ca. 1-3 mm thickness and negligible displacement, as well as strands of several bands with up to 2 cm thickness and a displacement of 1-2 cm. Grain size analysis of detrital quartz indicates cataclastic grain size reduction within the bands. A significant porosity reduction can already be recognized macroscopically, and is confirmed by image analysis from BSE images, revealing a porosity of 20-30% in the host sediment and 1-3% in the deformation bands. This dramatic porosity and permeability reduction is predominately caused by precipitation of Fe-dolomite cement within the deformation bands, where it occupies ca. 45% of the total rock volume. The chemical composition of this cement differs from the detrital dolomite grains of the rock, showing an increase in Fe2O3 from 10 to up to 12 wt%. This observation and the significant increase in volume of Fe-dolomite within the deformation bands suggest that the cement does not derive from the detrital dolomite grains.
We assume that after an initial increase of permeability by disaggregation and fragmentation of detrital grains and cement coatings, a Fe-rich carbonate fluid crystallized within these highly porous deformation bands, thereby reducing porosity relative to the host sediment. These "cementation bands" act as effective barriers to the migration of hydrocarbons, as indicated by different degree of oil staining on either side of the bands.