Low temperature porosity preserving microquartz from Upper Cretaceous sandstones of the Subhercynian Basin (Germany)

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Microquartz found in Late Santonian age sandstones in the Heidelberg Formation in Germany occurs in multiple episodes and preserves porosity by inhibiting syntaxial quartz overgrowths. Characterizing the microquartz and understanding the growth mechanisms can be applied to developing an understanding of porosity preserving microquartz in deep clastic reservoirs. Electron Backscatter Diffraction (EBSD) indicates at least three episodes of microquartz adjacent to completely syntaxial cemented sandstones and porous sandstones within several meters laterally. EBSD analysis also indicates the microquartz is misoriented with respect to the detrital sandstone grains, while the syntaxial quartz inherits the crystallographic orientation of the detrital grains. EBSD data also indicates that although the microquartz is misoriented, there is some control on the microquartz growth. Transmission Electron Microscope (TEM) indicates multiple phases of silica which are related to microquartz growth. Wavelength Dispersive Spectroscopy (WDS) indicates variations in trace elements in the microquartz, which could be related to variations in fluid composition during growth. Integrating the results from these analytical techniques has helped us develop our understanding of the processes controlling microquartz and improved our ability to reconstruct the diagenetic history of porosity preserving microquartz.

Investigating the metastability and nanomineral properties of synthetic and natural schwertmannite

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Schwertmannite, an iron oxyhydroxide sulfate nanomineral, plays a significant role in the geochemistry of acid mine drainage (AMD) as a metastable phase with respect to goethite and by retaining toxic metals, e.g. arsenic [1]. Schwertmannite's characteristic morphology is needles 100-300 nm long and only 5-10 nm in diameter extending from a dense aggregate; varying temperature and time during schwertmannite syntheses result in distinctive morphological variation. The transition from the 'pin-cushion' morphology of schwertmannite to acicular nanogoethite particles was also monitored using scanning electron microscopy and x-ray diffraction. Natural samples of schwertmannite from the Iberian Pyrite Belt in Southwest Spain were investigated using high resolution transmission electron microscopy. Lattice fringes revealed that localized crystalline areas may exist in a highly disordered matrix to form the schwertmannite needles (Fig. 1). The atomically rough needle surfaces suggest that schwertmannite contains a high density of active surface sites.

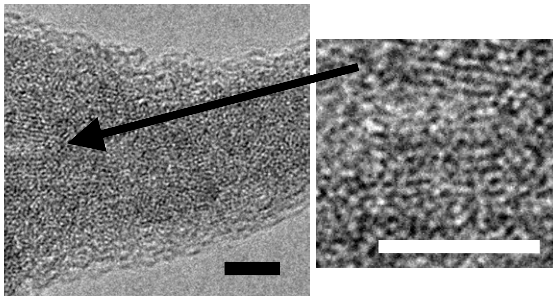

Figure 1: An individual needle on a natural schwertmannite particle. Scale bar = 5 nm.

[1] Acero *et al*. (2006) *GCA* **70**, 4130–4139.