Low-Temperature Porosity Preserving Microquartz from Upper Cretaceous Sandstones of the Subhercynian Basin (Germany)

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Microquartz found in Late Santonian age shoreface to coastal-plain 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 microquartz growth mechanisms can be applied to developing an understanding of microcrystalline quartz found in siliciclastic reservoirs, which preserves porosity in deep clastic reservoirs. Several advanced analytical techniques have been used to characterize the microquartz: Electron Backscatter Diffraction (EBSD) indicates at least three episodes of microcrystalline quartz adjacent to completely syntaxial cemented sandstones and porous sandstones within several meters laterally. Cathodoluminiscence (CL) indicates the microquartz is very small (1-5 microns), has a dull CL response, and a simple growth history compared to the syntaxial quartz overgrowths. 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 sandstone grains. EBSD data also indicates that although the microquartz is misoriented, there is some control on the 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 advanced analytical techniques in the Heidelberg Formation has helped us develop our understanding of the processes controlling the formation of microcrystalline quartz and syntaxial quartz overgrowths and improved our ability to reconstruct the diagenetic history of porosity preserving microcrystalline quartz.