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Identifying biogenic silica: Mudrock micro-fabric explored through charge contrast imaging

Jim Buckman[1], Carol Mahoney[2,*], Christian März[3], Thomas Wagner[4], and Vladimir Blanco[5]

[1]Institute of Petroleum Engineering, Heriot-Watt University, Riccarton, Edinburgh, EH14 4AS, Scotland
[2]School of Civil Engineering and Geosciences, Cassie Building, Newcastle University, Newcastle upon Tyne, NE1 7RU, U.K.
[3]School of Earth and Environment, University of Leeds, LS2 9JT, U.K.
[4]The Lyell Centre, Heriot-Watt University, Riccarton, Edinburgh, EH14 4AS, Scotland
[5]Instituto Colombiano del Petróleo, Ecopetrol, Bucaramanga, Colombia

Abstract

Visual inspection (optical microscope point counting) and silica abundance show that laminated shale from the Late Cretaceous of Colombia contains high levels of detrital quartz silt and sand particles. Closer examination using the charge contrast imaging (CCI) technique, however, illustrates that much of the quartz is authigenic micro-quartz, and thus not exclusively of detrital origin. In addition, many "sand" grains that otherwise appear to represent simple detrital quartz particles are actually of biogenic origin, representing the tests of agglutinated foraminifera, formed from cemented silt-sized quartz particles. Finally, CCI shows that original detrital grains have undergone authigenic modification, with both syntaxial overgrowths and micro-quartz. Without recognition of these features, the relative proportion of detrital quartz (sand) would otherwise be greatly overestimated, with important implications for environmental interpretation. Furthermore, the recognition of biogenic structures, including agglutinated foraminifera, provides additional environmental information that otherwise could be easily overlooked.

Keywords: Shale, silt, quartz cementation