

Mudrocks (Shales, Mudstones) at the Scale of Grains and Pores: Current Understanding

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Abstract

The fine-grained sediments and rocks that constitute most of the sedimentary record have received tremendous research attention in the past decade. This talk reviews some of the technologies that have supported these advances and summarizes current knowledge of the diagenetic processes that drive the evolution of bulk rock properties of mud in the subsurface. Electron microbeam instrumentation has been central to improving our understanding of fine-grained materials. In particular, improvements in resolution offered by field-emission electron guns and advances in sample preparation by various ion-milling techniques have allowed researchers to see tiny grains and pores in unprecedented detail. Grain assemblages in mudrocks vary across a very broad compositional range and the beginning compositions in muds have significant implications for the evolution of properties relevant to reservoir quality in mudrocks. It is now clear that the principal diagenetic processes of sandstones and limestones, compaction and cementation, also operate in mudrocks. Research efforts to quantify the roles of compaction and cementation are central in the quest to refine a predictive understanding of the evolution of mudrock properties in the subsurface.