



Influence of faulting on iron oxide concretion and Liesegang band patterns in poorly lithified sandstones of the Barreiras formation, NE Brazil: inferences for fluid flow in clastic reservoirs

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Different types of iron oxide deposits occur in poorly lithified, quartz-dominated heterolithic sandy sediments of the Barreiras Formation in NE Brazil. Their occurrence and geometry is influenced by the presence of fault zones. We studied the relations between iron oxide deposits and the structural, petrophysical and hydraulic properties of fault zones by combining structural analysis, permeability measurements, and petrographic and XRD analyses. According to our results, development of high-permeable damage and mixed zones during faulting promoted iron oxide precipitation as m-scale diffuse impregnations, cm- to dm-scale iron concretions and well cemented, dm- to m-thick mineral masses, the latter particularly at the fault core-mixed zone boundaries. On the other hand, formation of hydraulically isolated, fault-bounded compartments in between low-permeable fault cores in segmented strike-slip fault system prevented mineral masses precipitation promoting development of Liesegang bands. Fault reactivation in partially lithified and cemented sandstone promoted development of extensional fractures which acted as preferential pathways for circulation of reducing fluids, thus resulting in localized bleaching along fracture and, consequently, episodes of iron remobilization. This in turn resulted in further precipitates as iron concretions and, locally, as secondary and smaller Liesegang bands. Overprinting of different iron oxide deposit types indicates that strike-slip faulting in poorly lithified heterolithic sandstones may evolve from preferential conduit, focusing fast fault-parallel fluid flow, to conduit-barrier systems, thus reducing across-fault transmissibility and fluid flow influx in fault-bounded compartments. These inferences have important implications for fluid flow predictive modeling in hydrocarbon reservoirs.