# Diagenesis and Reservoir Heterogeneity in the Lower Tuscaloosa Formation at Cranfield Field, Mississippi

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## ABSTRACT

**The Cretaceous lower Tuscaloosa Formation in the Cranfield Field, Mississippi, is a siliciclastic reservoir and target for geologic $CO_2$ sequestration and enhanced oil recovery (EOR). The reservoir is approximately 3 km deep with an average thickness of 30 m. Samples and data are from six wells at the Cranfield Field including whole cores from four wells and multiple sidewall cores from two wells. The lower Tuscaloosa Formation consists of fining-upward fluvial cycles. The lowermost parts of the fluvial channels are typically composed of conglomerate, and contain a significant component of chert pebbles. The conglomerate is overlain by light gray coarse to medium to fine-grained sandstones with minor interbedded mudstone. Petrographic analysis indicates that both original composition and diagenesis extensively affect reservoir heterogeneity. In highly porous and permeable zones, the dominant controls on reservoir quality include the original coarse-grained texture, low compaction, formation of thick chlorite cement rims around grains preventing formation of quartz overgrowth, and formation of secondary porosity by dissolution of rock fragments and cements. Conversely, in the zones of low porosity and permeability, diagenetic events which are the most destructive of reservoir quality include high compaction, formation of carbonate, authigenic kaolinite, Feoxide and quartz cement. The presence of thin chlorite cement rims in the upper portion of the reservoir did not prevent formation of quartz overgrowths which is, overall, the most important factor reducing the porosity and permeability.**

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