Grain Coats on the Brazos: Using modern studies to understand the origin of porosity-preserving early clay grain coats*

Joann E. Welton[1]

*Abstract from 2010-2011 AAPG Foundation Distinguished Lecture presentation.

[1]ExxonMobil Upstream Research Company, Houston, Texas (joann.welton@exxonmobil.com)

Clay grain coats have long been recognized as one of the key controls on the preservation of deep reservoir quality. However, most grain coat studies have emphasized high temperature cement growth, ignoring the initial processes responsible for early coat development. A fundamental question is, how and why does clay adhere to grain surfaces?

To evaluate the primary controls on the development and distribution of early grain coats, a study was conducted on the modern Brazos River in Texas. The Brazos river was selected because it is a very clay-rich river, ranking 6th in terms of mean annual suspended sediment discharge (11mt/yr) in North America. It extends approximately 850 miles through central Texas, crossing a diverse climate zone ranging from semi-arid to subtropical. This allowed the investigation of multiple controls including: 1) the impact of bedrock geology, 2) fluvial style, 3) climate, 4) texture, 5) pedogenesis, and 6) the role of biological organisms in the development of grain coats.

Results confirmed that climate, texture, soil processes, and biological activity (e.g. microbial to land snails), do indeed play a critical role in the development of effective early grain coats. Recognition criteria for identification of early grain coat processes in ancient sandstones will also be discussed.