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Highly-Resolved X-Ray Fluorescence Based Model of Unconventional Reservoirs, Midland Basin, West Texas, USA

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ABSTRACT

When investigating an unconventional reservoir, it is important to understand many of the fundamental geological characteristics that are also analyzed during the exploration of conventional reservoirs. These characteristics include lithology, thickness and lateral structure of the reservoir and surrounding geologic units. Using a highly-resolved x-ray fluorescence (XRF) based chemostratigraphic study taken from existing cuttings and cores is a cost effective way to interpret an unconventional system. The XRF modeled mineralogy can be utilized to resolve sub-log-scale lithological variability and its impact on rock strength. A study was undertaken on eleven wells from Martin Co., Texas, and incorporates data from the Upper Pennsylvanian and Lower Permian intervals (Wolfcamp and Spraberry formations). XRF analysis was done for major and trace elements on the slabbed cores and cuttings. The chemofacies created from the elemental data collected allows for a chemical understanding of the heterogenous mixed succession of the shale, carbonate, and siltstone/sandstone lithofacies that accumulated in a deepwater marine environment during the Wolfcamp and Spraberry. Correlation of the chemofacies across the wells creates a three-dimensional model of the subsurface. The model allows for a representation of each unit's thickness and structure. Therefore, the model of the Wolfcamp and Spraberry provides the structure of the potential unconventional reservoirs found in the study as well as their elemental makeup which are important characteristics to consider for completion optimization and overall drilling strategies in unconventional reservoirs.

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