**Geochemical and Petrophysical Transformations during Rock-Fluid Interactions in Caney Formation, South Central Oklahoma**

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Production of unconventional hydrocarbon resources is key to satisfying growing demand for energy globally. In the United States, production from hydraulically fractured reservoirs is the main thrust of recent increases in hydrocarbon production. Applications of hydraulic fracturing technologies in hydrocarbon recovery is however relatively new with vast knowledge gaps. To harness the full potential of this technology, it is essential to understand the geochemical interactions between fracturing fluids and subsurface formations post-hydraulic fracturing. Study of geochemical rock-fluid interactions, mechanisms driving interactions and the products of these interactions provide insight to the causes of continuous production decline in hydraulically fractured reservoirs.

This work involves controlled batch reactor experiments using rock cores and rock cuttings to study rock-fluid interactions during and after hydraulic fracturing. Rock samples from selected depths within the Caney Formation in the Ardmore Basin are used. Powder samples prepared by crushing and grinding rock to particle sizes passing 400µm and further micronizing to finer sizes. This exposes more surface area for reaction. The reactions are conducted over a 30-day period at temperatures of 95oC and atmospheric pressure with minimal oxygen interaction during experiment. Fluids used in experiments are field hydraulic fracturing fluid and deionized water.

Evaluation of powders are conducted before and after experiments using Scanning Electron Microscopy/Energy Dispersive Spectroscopy (SEM/EDS) and X-Ray Diffraction (XRD) whilst elemental analyses of effluent are undertaken using Inductively Coupled Plasma Mass Spectroscopy (ICP-MS). Results from these techniques are integrated to identify initial compositions and products of geochemical reactions.

Preliminary results reveal transformation in samples mineralogical compositions due to dissolution of carbonates and pyrite and transformation of feldspars to clays. XRD compositional peaks also reveal increased composition of amorphous entities, supporting the theory of illite de-flocculation and fines migration. SEM/EDS studies do not show appreciable changes of the powders and precipitation of new minerals. Increased elemental compositions of Ca, Al, Si, Mg, Na, and Fe in solution points to considerable geochemical reactions between fluids and formation.

This work provides insight on subsurface geochemical interactions between fracturing fluids and Caney Formation. It highlights mechanisms controlling rock-fluid interactions in the subsurface. Findings from this study are therefore critical to developing optimal hydraulic fracturing fluids to mitigate undesirable impacts during and after hydraulic fracturing.