THE INFLUENCE OF PARTICLE SIZE AND MOISTURE ON THE PERMEABILITY OF CRUSHED SHALE SAMPLES: IMPLICATIONS FOR FLUID MOBILITY IN TIGHT ROCK RESERVOIRS

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ABSTRACT

Shale cuttings and cores extracted from the subsurface and stored for hours to decades tend to dry out and lose moisture which increases the effective matrix permeability of the sample. Accurate permeability measurements are needed in reservoir modeling and reserves estimation in shale. Moisture loss is a fundamental sample preservation problem which can be solved by developing a standard protocol to restore moisture in cores and cuttings to obtain precise permeability measurements. Our objectives is to evaluate the relationship between moisture content in crushed shale samples and matrix permeability. The permeability of moisture equilibrated samples will be measured with the shale matrix permeameter. Preliminary results indicate crushed shale mass becomes stable after 48 hours of moisture equilibration with a percentage moisture content of approximately 2 % for particle size 1.4 mm (US mesh size 14). Permeability results are anticipated to be inversely proportional to moisture content allowing us to predict permeability at variable moisture content. The results from mineral content and pore size distribution will be analyzed for correlations with permeability. The overall results will be used to establish a protocol for moisturizing shale samples, and a manuscript prepared and sent to peer-reviewed journals. Experiments are ongoing to determine relationship between the moisture equilibrated particles and permeability and to quantify the mineral content in shale using a quantitative X-ray diffractometer.

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