Estimating Permeability and Modeling Capillary Pressure Behavior for Shaly Sandstones

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The purpose of this study is to predict permeability and construct drainage capillary pressure curves for shaly sandstones. Six published and unpublished data sets are used to establish empirical relationships for permeability, effective porosity and grain size. The samples represent a wide range of sandstones and shaly sandstones with porosities from 3.9% to 33.2% and permeabilities from 0.031md to 8043md. The study shows that median pore-throat size plays a controlling role on permeability. Effective porosity, which can be estimated from clay content and distribution, indicates a good correlation with pore-throat size, and thus can be used to estimate permeability. Predicted permeabilities have excellent agreement with measured permeabilities. Therefore, the proposed empirical equations can be applied for other sandstones and shaly sandstones with porosities and clay content from thin-section, core measurements or well logs. Effective porosity can also be estimated from capillary pressure curves, and thus provides a new way to calculate permeability from capillary pressure measurements.

Capillary pressures usually have good correlation with permeability and porosity. In this study, we propose a method to construct drainage capillary pressure curves from porosity and permeability. Good fits between synthetic and measured capillary pressure curves have been achieved. Since both porosity and permeability can be calculated from well logs, the method can also be used to construct capillary pressure curves from well logs.