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Use of Geochemical Analyses to Evaluate Shale Gas Plays

Geochemical analyses provide an inexpensive and accurate means for evaluating shale gas plays. During early play development, geochemical analyses can provide an initial risk assessment using archived rock samples. Then, if the play does go forward, geochemical analyses on fresh well samples can give additional valuable information specific to subsequent resource development.

Considering the early play development phase, parameters needed for initial risk assessment can be obtained from archived rock samples and well logs. Among the parameters requiring evaluation during this stage are: Total Organic Carbon, thickness, and thermal maturity (vitrinite reflectance, T_{max}, and Transformation Ratio). Such data provide information on whether or not the amount of organic matter and maturity are sufficient for gas generation. For example, in order to generate adequate volumes of thermogenic gas, a TOC of at least 2% (in immature rocks) and a minimum thickness of about 50 feet are needed. In addition, Transformation Ratios calculated from basin modeling furnish information on timing of gas generation.

If initial minimum criteria are met and a well is drilled, geochemical analyses on fresh well samples can give more detailed, play-specific information. Inexpensive custom headspace gas analyses supply quick initial approximations of gas yield. Mud and headspace gas analyses provide information on reservoir compartmentalization and gas composition, maturity, and origin (thermogenic, biogenic, or a mixture). Furthermore, a determination of whether liquid hydrocarbons might interfere with gas flow can be made by integrating geochemical and engineering data. Examples are used to illustrate specific applications and evaluations.