Development of Unconventional Gas Prospects and Evaluation of Producing Using Geochemical Techniques

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As demand for natural gas intensifies, identifying and producing reserves from unconventional (continuous) resources close to markets have gained considerable exploration interest and activity. Unconventional natural gas systems include fractured shale gas (FSG), tight gas sands (TGS), basin center gas (BCG), shallow basin methane (SBM), and coalbed methane (CBM). The origin of natural gas in these types of accumulations may be thermogenic sources either from primary cracking of organic matter or secondary cracking of bitumen and oil into gas or mixed thermogenic-biogenic sources. Gas may be further categorized as in-situ generated-reservoired (e.g., FSG, SBM, CBM) or as migrated gas (e.g., BCG). Fundamental geochemical and petrophysical characteristics of the petroleum system such as organic richness thermal maturity, porosity/permeability, and expulsion provide some of the source controls to map favorable production fairways (sweet spots).

Data from unconventional gas systems such as fractured shales, tight gas sands, and shallow basin methane are used to show how source maturation, primary and secondary gas yields, and BTU contents can be mapped for high-grading prospects and in-fill well drilling locations.

Delineation of gas compartments can also be used to aid in production strategies, field development, and structure. Using gas composition and isotope data from samples taken from the gas flow line, canned cuttings desorption yields, and crushed cuttings gas yields, total gas yields, gas mixing, and gas compartments can be determined. Production allocation of gas reservoirs can be accomplished if gas samples from specific zones are collected prior to well completion.