Using ArcGIS to Estimate Thermogenic Gas Generation Volumes by Upper and Middle Devonian Shales in the Appalachian Basin

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Using ArcGIS and a geochemical database from GeoMark's Appalachian Basin Petroleum System Study, we estimate the volume of high maturity thermogenic gas generated by both the Marcellus and the Ohio sections of the Appalachian Devonian Shale. A new parameter, TOCgen, that represents the amount of organic carbon attributable to hydrocarbon generation, was calculated using TOCpd (present day TOC) and TOCo (original TOC) maps for the Devonian Marcellus and Ohio Shales. The TOCgen represents carbon expelled as oil and gas during oil window maturities as well as carbon in oil and gas that remained in the shales. The remaining carbon, converted to gas at high levels of maturity constitutes the bulk of the unconventional shale gas resource. A map of the generated gas volume of this resource was made using TOCgen, Devonian shale generation kinetics, expulsion efficiencies, and shale thicknesses. Based on these geochemical parameters, our map shows an area from central New York trending southwest into northern West Virginia as a favorable shale gas production fairway. Maps of gas wetness and BTUs show the overall quality of thermogenic gas generated from the Devonian shales is good. Typically, these gases have BTU values greater than 1000. The values decrease somewhat to the east in the basin reflecting the drier gas associated with the increasing thermal maturity of the generating shales.