

Thermal Maturity Map of the Devonian Shales of the Appalachian, Michigan, and Illinois Basins

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USGS geologists have created a new thermal maturity map of the Devonian shales of the Appalachian, Michigan and Illinois basins of the United States. The outline of the shale was constructed by digitizing shale formations taken from official state geologic maps, and a geologic map of Canada in ArcGIS and then latticed together to form a polygon. Resolution of the state maps varies, and some interpretation was necessary through portions of the Great Lakes and at “state line faults.” Thermal maturity isograds were then overlaid on the polygon to create polygons showing areas of immature, oil window, gas window, and overmature shale. The isograds were constructed using varying thermal indicators such as vitrinite reflectance (Ro), Conodont Alteration Index (CAI) Thermal Alteration Index (TAI), Spore color Index (SCI) and published literature.

The Appalachian basin contains all four thermal maturation windows going from high maturation in the East and decreasing to low maturation in the west. The Michigan basin has a small amount of Devonian shale in the gas and oil window, with the majority of it being immature. The Illinois basin has shale in the oil window and shale that is thermally immature. This map shows the greatest potential for oil shale resources is in the western Appalachian basin, along with the margins of the Illinois and Michigan basins.