

**Title:** Investigation of Clay Content as Being a Cause for Suppression of Pyrolysis Tmax Maturity Data in the Wolfcamp B

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### **Abstract**

The results of a Pilot well drilled through the Wolfcamp B formation in the Permian Basin, Texas, USA, was investigated for the cause of an observed decrease of Tmax maturity values with depth. Usually, maturity increases with depth, whereby a 500 ft depth increase, would equate about ½ % increase in vitrinite reflectance maturity measurement, %Ro (25 ° of Tmax); for instance, the change from 0.65% - 1.10% Ro (435° - 460° Tmax). Producibility hydrocarbons content is impacted by maturity level. 167 drill cuttings samples were recovered at 10 ft intervals, from a 1000 ft thick Wolfcamp B section. Samples were analyzed for hydrocarbons generative potential and Tmax maturity using pyrolysis. In addition, they were analyzed for their mineralogy and elemental minerals composition using XRD and XRF methods respectively. Mud logging of their gas contents was done too. S<sub>2</sub>, Tmax and Hydrogen Index results for 66 samples from the 12,000 – 12,690 ft section averaged 4.59 mg HC/g rock, 444 °C and 234 respectively while their total clay, SiO<sub>2</sub>, Al<sub>2</sub>O<sub>3</sub>, Cl, and gamma ray values averaged 36%, 55.51 ppm, 8.9 ppm, 0.32 ppm, and 81.65 API units respectively. S<sub>2</sub>, Tmax and Hydrogen Index results for 39 samples from the 12,700 – 13,080 ft section averaged 5.03 mg HC/g rock, 442 °C and 239 respectively while their total clay, SiO<sub>2</sub>, Al<sub>2</sub>O<sub>3</sub>, Cl, and gamma ray values averaged 41, 46%, 57.41 ppm, 11.56 ppm, 0.33 ppm, and 124.38 API units respectively. The analyzed Wolfcamp B, 12,000 – 13,080 ft interval displayed distinct zones for the sum of C<sub>1</sub>, C<sub>2</sub>, C<sub>3</sub> and C<sub>4</sub> ppm values, and range of the C<sub>1</sub>/C<sub>4</sub> ratio. The depth intervals of 12025 – 12250 ft, 12275 – 12400 ft, 12425 – 12750 ft and 12775 – 13080 ft had a sum of C<sub>1</sub>, C<sub>2</sub>, C<sub>3</sub> and C<sub>4</sub> ppm values of <2400 ppm, <2400 ppm, 2400 - >4800 ppm and <2400 ppm respectively. For these depth intervals of 12025 – 12250 ft, 12275 – 12400 ft, 12425 – 12750 ft and 12775 – 13080 ft, the ratio of C<sub>1</sub>/C<sub>4</sub> was <24000, <24000, 24000 - >48000 and <24000 respectively. A contrast in the hydrocarbons generative potential, Tmax maturity level, mineralogy, elemental minerals composition and gas contents of the relatively clay poor 12,000 – 12,690 ft section with that of the relatively clay rich 12,700 – 13,080 ft was observed. Evidently, the Tmax maturity level of the deeper relatively clay rich Wolfcamp B section was lower than that of the upper relatively clay poor one and so it was concluded that it is the increased clay content that is suppressing the Tmax.