Interlaboratory Comparison of Programmed Pyrolysis Data Generated by Different Instruments: A Case Study on the Barnett Shale

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EXTENDED ABSTRACT

Programmed pyrolysis screening has been widely used for over 40 years and is an integral tool for evaluating source rock quality and providing information on organic content, type, and thermal maturity. The method is popular because it generates useful parameters relatively quickly, is simpler to perform than other types of measurements, and, in many cases, can be interpreted in a straightforward way. In this study, programmed pyrolysis results from several laboratories were obtained and compared to determine how consistent results are between different laboratories and instruments. Measurements were made using several currently available instruments, including: Vinci Technologies Rock-Eval 6 (RE6), Weatherford Laboratories Source Rock Analyzer (SRA), and Wildcat Technologies Hydrocarbon Analyzer with Kinetics (HAWK). All results were evaluated and compared to measurements made using what is generally considered to be the industry standard Rock-Eval 2 (RE2) instrument, which is no longer in production but still widely used. Data were collected on several sample sets, including a set of 30 Barnett Shale samples representing a natural thermal maturity sequence. In general, the results from the various laboratories and instruments were similar when referenced to RE2 measurements (Fig. 1). Coefficient of determination (R^2) values for S1 and S2 were greater than 95% and slopes (zero intercept) ranged from 0.82 (S1, RE6) to very near unity (S2, HAWK). The S3 parameter showed greater variability between newer instruments and RE2, with R^2 values ranging from 61% (HAWK) and 71% (SRA) and slopes from 0.83 (HAWK) to 0.99 (SRA). The inconsistencies in S3 are attributed to differences in the detectors used to measure CO_2 generated during pyrolysis. Values for Tmax were consistently within ~2 Â°C for all instruments with the exception of a few outliers that showed unusually low Tmax for RE6, SRA, and HAWK (330 to 340 Â°C) relative to those determined by RE2 (415 to 425 Â°C) and a few samples with Tmax values exceeding RE2 capabilities (>550 Â°C). All currently available programmed pyrolysis instruments tested are capable of generating results that are generally consistent with RE2 using the standard 'Rock-Eval' temperature program.

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