



Revised Methods for Source Rock Evaluation Using Rock-Eval Data: Examples from Producing and Potential Shale Gas Plays

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Summary

Rock-Eval pyrolysis has been widely accepted by the industry as a useful tool for quick, easy and cost effective source rock evaluation (Peters, 1986; Bordenave et al., 1993; Jarvie, 2012a, b). However, there are misconception and confusion in applying the Rock-Eval data to source rock evaluation due to heterogeneity in thermal maturity among samples, which could lead to erroneous results if misused. Understanding of source rock generation kinetics enables a better classification of kerogen type and estimation of generation potential in source rock evaluation. Data interpretation from the perspective of kerogen kinetics may help remove apparent differences in kerogen generation capacity due to varying maturity among samples by comparing data along their thermal decomposition trajectory.

We propose the use of the data-driven kinetic model (Chen and Jiang, 2015) to assist Rock-Eval data interpretation for checking: a) whether the data under study come from a single population of source rock with similar kinetic properties, b) the maturation level, and c) characteristics of the hydrocarbon generation kinetics, such as onset and end of massive generation, and the complexity of kerogen composition.

We also introduce a dimensionless plot of S₂-TOC for source rock evaluation to eliminate the impact of thermal maturation on generation potential estimation. The dimensionless variables are defined by rescaling the measures against their original values before thermal decomposition. The resulting dimensionless variables become unit length with a measure between 0 and 1. Thus samples from the same genetic population of source rocks with similar generation characteristics and kerogen kinetics align along a single line regardless of their thermal maturity levels with the horizontal axis intercept indicating the percentage of inert organic carbon in initial TOC.

This paper presents the methods and discusses the applications. The construction of kerogen kinetics models from Rock-Eval data and the use of the kinetics models to assist data interpretation in various circumstances will be demonstrated through examples from selected producing and potential shale gas plays in Canadian sedimentary basins.

References

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