

Thermal, kinetics, and oxidation mechanism studies of light crude oils in limestone and sandstone matrix using TG-DTG-DTA: Effect of heating rate and mesh size

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Abstract

© 2016 Taylor & Francis Group, LLC. This research was focused on the combustion kinetics and oxidation mechanisms of light crude oils in limestone and sandstone matrices. Similarity of the TGA-DTA curves was produced for different crude oils + limestone or sandstone mixtures indicates that the crude oil undergoes three major transitions, known as low-temperature oxidation, fuel deposition, and high-temperature oxidation when subjected to an oxidizing and constant rate environment. Kinetic analysis of the low- and high-temperature oxidation regions was performed using the ASTM and Arrhenius kinetic methods. In reaction mechanism of the combustion reactions, oxidation mechanisms, and rate-controlling steps of fluid-solid reactions in limestone matrix was also determined. It was observed that the linear behavior at elevated temperatures justifies the assumption that chemical reaction was the controlling step.

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Keywords

Combustion, crude oil, kinetics, oxidation mechanism, thermal analysis