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Title	Reaction Kinetics of Fuel Formation for In-Situ Combustion
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Preview	<p>Summary. Chemical reactions believed to cause fuel formation for in-situ combustion have been studied and modeled. A thin, packed bed of sand/oil mixture is heated under nitrogen flow at linearly increasing temperatures, simulating the approach of a combustion front. Analysis of gases produced from the reaction cell revealed that pyrolysis of crude oil in porous media goes through three overlapping stages: distillation, mild cracking (visbreaking), and severe cracking (coking). Expressions that govern the rates of the two cracking reactions are derived, and a technique is outlined to obtain initial estimates for their parameters from the experimental data. The parameters of a proposed distillation function, as well as refined estimates for the cracking reaction parameters, are obtained by non-linear regression methods based on an overall kinetic model. Successful matching of the experimental data, including the total amount of fuel deposited, was achieved with this model. It was found that fuel formation was a result of two successive cracking reactions that the oil undergoes at temperatures above 280 degrees C [536 degrees F]. Also, distillation of crude oil at temperatures below 280 degrees C [536 degrees F] played an important role in shaping the nature and extent of the cracking reactions. The operating pressure and the rate of heating of the sand/oil sample were found to affect the fuel-formation process only through the influence exerted on distillation. Clay minerals showed a catalytic effect on the cracking reactions, especially coking. Finally, the asphaltene fraction of a crude oil was found to correlate with the fuel content of that oil.</p>

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