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Experimental and Numerical Studies of Aquathermolysis Tests of Christina Lake Bitumen with Steam

Zied Ouled Ameur[1,2], Chris Elliott[1] and Simon Gittins[1]
1. Cenovus Energy 2. Now Independent Consultant.

Summary

H2S emissions from thermal recovery operations of bitumen and heavy oil are becoming an increasing concern. Many SAGD programs in northern Alberta are finding H2S level rising as well aging. The generation of H2S is due to an aquathermolysis reaction of bitumen or heavy oil with high temperature steam that converts sulfur-containing compounds in bitumen, minerals (pyrite), sulphate into H2S. The amount of H2S depends on forms of sulphur, types of reaction, kinetics, and may vary from reservoir to reservoir.

This study used Christina Lake bitumen and experimentally determined the H2S onset temperature upon reacting with steam for 3 days. Then the amount of H2Sand other gases generated by aquathermolysis, including CO2, CO, H2, and light hydrocarbons were quantified and detailed analysis of the post-reaction oil composition were performed. The temperature effect was studied on the amount of generated gases at 212, 223, and 242°C, and reaction time effect for 3, 30 and 45 days respectively. The results show the amount of generated gas increases with both reaction temperature and reaction time. The experimental data are used to create a kinetic predictive model which can be further implemented into the compositional and thermal simulation to predict components' variation in the field scale. The bitumen after aquathermolysis were measured for its viscosity at "live" conditions, and it was found that the viscosity slightly decreased with reaction time at the same reaction temperature.

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References

Barroux, C., Lamoureux-Var, V., Flauraud, E., IFP Energies Nouvelles, Forecasting of H_2S Production due to Aquathermolysis Reactions, SPE 164317, 2013.

Lamoureux-Var, V., Barroux, C., Using Geochemistry to Address H_2S Production Risk due to Steam Injection in Oil Sands, SPE 165437, 2013.

Lamoureux-Var, V., Lorant, F., Method for Constructing a Kinetic Model allowing the Mass of Hydrogen Sulfide Produced by Aquathermolysis to be Estimated. US Patent No. 2007/0100591 A1.