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Asphaltene stability in crude oil during production process

Hadi Belhaj

The Petroleum Institute, P.O. Box 2533, Abu Dhabi, UAE

Abstract

Asphaltene instability may take place in the reservoir leading to permeability damage and contributing to flow restriction issues. It may also occur in production strings and surface facilities causing conduit clogging. Variation of oil composition, temperature and pressure during production leads to instability of crude oil and asphaltene precipitation.

In this study, the stability of target crude oil/diluted crude oil and asphaltene suspensions under the influence of a direct current (DC) are investigated. The amount of the asphaltene deposit and its electrical charge at various operating conditions are investigated. Moreover, the impact of addition of resins into crude oil mixtures is studied.

The method consists of applying a DC voltage between two metal electrodes immersed in the crude oil sample. The amounts of deposits buildup on the surfaces of the electrodes are recorded during experiment time utilizing a miniature two load cells connected to the electrodes. Electric field strength up to 250 V/cm is applied. This study confirms that asphaltene colloids are electrically charged. The fact that deposits form on the anode surface proves that asphaltene particles possess a negative charge. Microscopic studies are presented to relate the deposits structure with the operating parameters. The experiment shows that time is a sensitive parameter. At the first 12 hours, more than 70% of the deposition occurs. The rest takes up to four days to deposit. This phenomenon reflects either limited amount of asphaltene exists in the sample, or that the resin content plays a major role in asphaltene colloids charge switch.

Biography

Dr. Hadi Belhaj is a faculty member with the Petroleum Institute teaching varieties of petroleum engineering courses; from Reservoir Engineering to Reservoir Characterization & Modeling to Flow Assurance and Production Chemistry. Dr. H.A. Belhaj has over 30 years of combined petroleum industrial and academic experience with key qualifications in reservoir engineering, reservoir simulation & modeling, sand production control technology, and production technologies. Geographically, his experience is spread over five of the six contents.

During the past ten years, Dr. Belhaj has contributed a number of consortium research proposals dealt with petroleum engineering and energy exploitation challenging issues. This effort generated over $17 Millions of research grants. Dr. Belhaj has presented over 70 guest speaker lectures, seminars and workshops for both industry and academia. Dr. Belhaj authored two books on reservoir simulation technologies and has published over 100 articles.

Hadil Abu Khalifeh is a research and teaching associate in the Petroleum Institute under Dr. Belhaj's supervision. She has completed her PhD from Ryerson University/Canada.