| | |
|---|---|
| Please fill in the name of the event you are preparing this manuscript for. | International Petroleum Technology Conference 2023 (15th IPTC) |
| Please fill in your 5-digit IPTC manuscript number. | IPTC-22920-Abstract |
| Please fill in your manuscript title. | A Comprehensive Research of Feasibility of Low Cost Alkali-Cosolvent-Polymer (ACP) Flooding in Heavy Oil Reservoirs |


Please fill in your author name(s) and company affiliation.

| Given Name | Surname | Company |
|---|---|---|
| Yi-Bo | LI | State Key Laboratory of Oil and Gas Reservoir Geology and Exploitation, Southwest Petroleum University |
| He-Fei | Jia | State Key Laboratory of Oil and Gas Reservoir Geology and Exploitation, Southwest Petroleum University |
| Hao | Gao | Oil and Gas Technology Institute of PetroChina Changqing Oilfield Company |
| Jia-Yue | Lu | State Key Laboratory of Oil and Gas Reservoir Geology and Exploitation, Southwest Petroleum University |
| Tian-Shuang | He | State Key Laboratory of Oil and Gas Reservoir Geology and Exploitation, Southwest Petroleum University |
| Wan-Fen | Pu | State Key Laboratory of Oil and Gas Reservoir Geology and Exploitation, Southwest Petroleum University |




## Abstract


Cold production is a challenge for heavy oil because of its high viscosity and poor fluidity in reservoir conditions. The oil displacement efficiency and injection cost of heavy oil are the main constraints of heavy oil cold production. Alkali–cosolvent–polymer (ACP) flooding is a type of microemulsion flooding that has low cost and possible potential for heavy oil reservoirs because it does not require the use of a synthetic surfactant, which is the most expensive chemical in these processes in most cases. In this study, we experimentally investigate the performance of ACP flooding in ultra-heavy-oil reservoirs in which steam flooding and injection timing of polymers in ACP technology are currently deployed. The interfacial tension between various alkali–cosolvent formulations and heavy crude oil is measured for selecting the appropriate formulation. Phase behavior tests are performed to determine the most appropriate formulation and conditions for the generation of the microemulsion. Sandpack flooding experiments are set up to investigate the displacement efficiency of the selected ACP formulation. The results show that, for heavy oil, butanol random polyether BPE-1000 exhibits good performance in reducing the water–oil interfacial tension (to an order of magnitude of $10^{-3}$ mN/m) and forming a favorable Type III microemulsion under reservoir conditions. The results of sandpack flooding experiments show that, compared to water flooding, the ones using an injected ACP formulation slug have a reasonable injection pressure and a low-concentration polymer slug has a favorable injectivity. An ACP slug followed by a polymer slug exhibits excellent results with ultra-heavy oil. With the addition of an AC or ACP slug, the displacement efficiency was 30%–50% higher than in the case of waterflooding. The maximum pressure gradient during AC or ACP flooding was around 2.8–9.5 psi/ft. We hope that this study can provide new ideas for prospects of thermal recovery in cold production.