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Project Title:

Experimental investigation of crude oil removal from water using polymer adsorbent

Abstract:

While extracting oil and gas from underground reservoirs, a large amount of water is produced, which increases during the reservoir's life. Given the scarcity of water supplies and the high volumes of water produced, proper management and usage in various applications are essential. The main objective of this study is to adsorb the remaining oil from produced water using a biodegradable polymer of chitosan. The hydrogel of chitosan and polyethylene glycol was synthesized with different ratios of 1:1, 2:1 and 3:1 and epichlorohydrin was used as cross-linker. The ratio of 3:1 of chitosan/polyethylene glycol was chosen as the optimum, which had the highest adsorption capacity. To improve efficiency and hydrophobicity of the synthesized hydrogel, multi-walled carbon nanotubes were also added, and finally, the chitosan/polyethylene glycol/multi-walled carbon nanotubes composite was synthesized. The synthesized adsorbent was characterized using FTIR, FE-SEM, and BET analyses, and the results indicated that modification was successful. The results showed that the addition of multi-walled carbon nanotubes in the structure of hydrogel increases the hydrophobicity and surface area up to 20 times. The results of batch adsorption studies specified that the maximum adsorption capacity occurs at pH = 3, oil concentration and adsorbent dosage of 1 g/l. Moreover, the isotherm and kinetics studies revealed that the process obeys Langmuir isotherm and the pseudo-second-order model.