OMICS Group Conferences
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World Congress on
Petrochemistry and Chemical Engineering
November 18-20, 2013 Hilton San Antonio Airport, TX, USA

Application of hydrophobically modified starches as additives in oil based drilling fluids

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Among drilling fluid's functions, the consolidation of the geological formation and the controlling of liquid phase fluid (filtrate) penetration can be highlighted. The influx of filtrate into productive zones can cause a significant reduction of permeability and hence lower well productivity. The aims of this study were to investigate the potential application of modified starches as filtrate loss additives in oil based drilling fluids. The starch was hydrophobically modified. Six types of structure were synthesized using different vinyl ester/starch molar ratios. The material's structure was characterized by FTIR and NMR spectrometry. The invert emulsion drilling fluids (brine / n-paraffin) were prepared from a standard formulation. The performance of aged and non-aged fluids was investigated by electrical stability, rheology and filtration at high temperature and high pressure. The incorporation of lauryl and stearyl units in the starch structure was confirmed by the appearance of new absorption bands at 1740 – 1745 cm-1, attributed to the carbonyl of the ester. The values found for the chemical modification degrees varied from 0.65 to 2.95. The fluids prepared from starch based additives showed rheology and filtration values within specifications and very close to those obtained for the fluids formulated with a commercial additive. Systems prepared with additives obtained from 2:1 vinyl ester/starch molar ratio produced 3,0 mL of filtrate volume under aged conditions, with higher efficiency compared to commercial sample. The physical-chemical results of the investigated fluids revealed that formulations developed from starch fatty esters are technically capable of competing with the commercial standard fluid.

Biography

Elizabete Fernandes Lucas is Chemical Engineer and obtained her D.Sc. degree in Polymer Science and Technology from Federal University of Rio de Janeiro (UFRJ) in 1994. She is Associate Professor at UFRJ since 1994 and has been accumulating a great experience in Polymer Science Applied to Petroleum Production for about 25 years. She is the director of the Laboratory of Macromolecules Applied to Petroleum Production (LMCP), has published 107 scientific papers, presented more than 250 talk/poster at conferences and written 3 books, 1 polymer dictionary, 1 vocabulary of oil chemistry and refining (in 4 languages), 1 book translation and 3 chapters of books. Since she has a strong interaction with petroleum industry, about 90 research reports and 36 technical reports have been prepared. The main studies involve polymer synthesis/characterization/properties, physical-chemistry of polymer solution, rheology of polymers and methods to evaluate the performance of polymers applied to different operations in oil production, from drilling to oil and water treatment. In such field, she has directed 30 master dissertations and 14 doctor thesis, and has 7 master dissertations and 11 doctor thesis under direction.

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