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Non-vulcanized natural rubber degraded products applied to reduce the freezing of n-paraffin fluids

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Drilling fluids of petroleum wells have evolved greatly in recent years. Currently systems containing n-paraffins are widely utilized. However, when such systems are subjected to high pressures and lower temperatures can present problems related to fluidity, due to the characteristics of crystal formation by freezing of n-paraffin (continuous phase). This formation can develop and lead to the freezing of the fluid, forming a solid block which can cause clogging of the flow lines of fluid. In order to improve the flow of these fluids at low temperatures iso-paraffin has been used in considerable volume ratio, however its low flash point compromises security, especially during its storage in offshore platforms. Alternatively, in this work, products of non-vulcanized natural rubber degradation have been tested as additives able to replace iso-paraffin and maintain the paraffin fluidity at low temperatures. The products were obtained from two different chemical routes: (1) degradation of Brazilian latex of natural rubber (NR), containing around 60% of dried weight, with periodic acid, according to a methodology adapted from the literature; (2) degradation of coagulated NR with Hoveyda-Grubbs 2nd generation catalyst in presence of β-pinene as transfer agent, based in works presented in the literature. The oligomers obtained were characterized by 13C-nuclear magnetic resonance (NMR) with ATP technical, chromatography size exclusion (SEC) and infrared spectroscopy (FTIR). The behavior of the systems additive/n-paraffin was evaluated by rheometry, to determine viscosity profile as function of temperature, and by differential scanning microcalorimetry (μDSC). The results showed that the performance of the additives on reducing the critical temperature fluidity loss of the n-paraffin fluid is related to: chemical structure and molar mass. Under conditions more representative of reality wellbore, it was also observed that higher the pressure worse the efficiency of the additive. As conclusion, it is believed that products of non-vulcanized natural rubber degradation can be potentially used at drilling fluids operations as an impediment element of the n-paraffin solidification at low temperatures.

Biography

Renata Pires is chemical engineering and completed her master's degree at Federal University of Rio de Janeiro in 2008. Currently, she is finishing her Ph.D. in drilling fluids at the same university. She has also been working as researcher and supervises P&D projects to petroleum industry. She has published 5 papers in reputed journals.

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