Rheology and corrosiveness of anionic viscoelastic surfactant fluid

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Abstract (300 word limit)

Anionic viscoelastic surfactant fluid(AES/NaCl) has unique rheology, which can been applied widely in petroleum industry. However, the high corrosiveness property of AES/NaCl fluid limits its extensive applications in petroleum industry. The effects of different salts on rheology and corrosiveness of this fluid system were studied to obtain a low corrosive viscoelastic surfactant fluid.

The rheological properties, including steady-state and dynamic, were investigated by an Anton Paar MCR 302 stress-controlled rheometer. The shear viscosity of the sample was measured at 30℃ from 0.1 to 1000 s^{-1}. The zero-shear viscosity of the sample was determined from steady shear measurement by extrapolating the viscosity-shear rate curve to zero shear-rate. The dynamic properties were measured by performing a frequency sweep from 0.1 to 100 rad/s in the linear viscoelastic regime. The coupon test was used to study the corrosion rate of N80 steel in the sample.

It has been found the shear viscosity of 5.0% AES solutions increased with the increasing salt concentrations, except for NaCl. The zero-shear viscosity of 5.0% AES solution with 8.0% Na_2CO_3 is similar to that of the solution with 6.0% NaCl, showing good viscosity, which are better than that of the solution with 8.0% $NaNO_3$ and 8.0% Na_2HPO_4. For the sample of 5.0% AES solutions with 8.0% Na_2CO_3, a Maxwell-like behavior accompanying with highly viscoelasticity is observed. Moreover, the result of coupon test shows that the corrosiveness of the sample of 5.0% AES solutions with 8.0% Na_2CO_3 is greatly less than that of the solution with 6.0 NaCl

Hence, the Na_2CO_3 should be able to be used as additives to improve the rheological properties and reduce corrosiveness of the anionic viscoelastic surfactant fluids.

Image

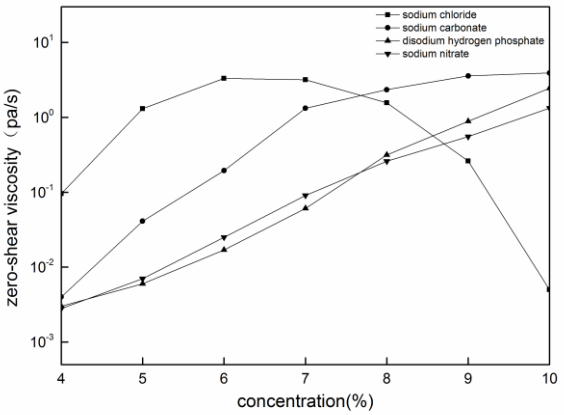


Figure 1. Zero-shear viscosity of 5.0% AES solution as a function of the concentration of different salts at 30 ℃.

Recent Publications (minimum 5)

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2. Zhang, Y.M.; Zhou, D.P.; Feng,Y.J. (2015). In-Situ Formation of Viscoelastic Wormlike Micelles in Mixtures of Non-Surface-Active Compounds. Journal of Surfactants and Detergents,18(1),189-198.
3. Al-Sadat, W., Nasser, M. S., Chang, F., Nasr-El-Din, H. A., & Hussein, I. A. (2014). Rheology of a viscoelastic zwitterionic surfactant used in acid stimulation: Effects of surfactant and electrolyte concentration. *Journal of Petroleum Science and Engineering*, 124, 341-349.
4. Yang, J., Yang, Z., Lu, Y., Chen, J., & Qin, W. (2013). Rheological properties of zwitterionic wormlike micelle in presence of solvents and cosurfactant at high temperature. Journal of Dispersion Science and Technology, 34(8), 1124-1129.
5. Rogers, S. A., Calabrese, M. A., & Wagner, N. J. (2014). Rheology of branched wormlike micelles. *Current Opinion in Colloid & Interface Science*,19(6), 530-535.
6. Liberatore, M.W., Nettesheim, F., Vasquez, P. A., Helgeson, M. E., Wagner, N.J., Kaler, E.W., Cook, L. P., Porcar, L. P., Hu, Y. T. (2009)Microstructure and shear rheology of entangled wormlike micelles in solution. *Journal of Rheology*,53(2):441–458.



Biography (150 word limit)

Wenlong Qin was born in 1978. He received his PhD degree in Geodetection and Information Technology Engineering from the department of Geology, Northwest University, Xi'an, China, in 2012. Currently, he is a associate professor at the College of Petroleum Engineering, Xi'an Petroleum University, Xi'an, China. His research interests include nano-micelle interactions, viscoelastic surfactant fluid and wastewater treating.

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Notes/Comments: