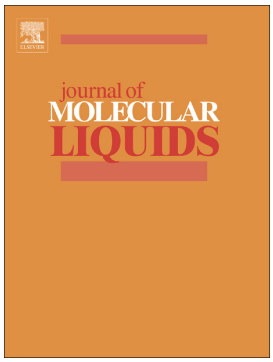

A triterpenoid saponin as an environmental friendly and biodegradable clay swelling inhibitor

Aghil Moslemizadeh, Saeed Khezerloo-ye Aghdam, Khalil Shahbazi, Sohrab Zendehboudi

PII: S0167-7322(17)32456-X
DOI: doi:10.1016/j.molliq.2017.10.003
Reference: MOLLIQ 7963

To appear in: *Journal of Molecular Liquids*

Received date: 4 June 2017
Revised date: 13 August 2017
Accepted date: 1 October 2017

Please cite this article as: Aghil Moslemizadeh, Saeed Khezerloo-ye Aghdam, Khalil Shahbazi, Sohrab Zendehboudi , A triterpenoid saponin as an environmental friendly and biodegradable clay swelling inhibitor. The address for the corresponding author was captured as affiliation for all authors. Please check if appropriate. Molliq(2017), doi:10.1016/j.molliq.2017.10.003

A triterpenoid saponin as an environmental friendly and biodegradable clay swelling inhibitor

Aghil Moslemizadeh,[a*] Saeed Khezerloo-ye Aghdam,[a] Khalil Shahbazi,[a] Sohrab Zendehboudi,[b]

[a] Department of Petroleum Engineering, Petroleum University of Technology, Ahwaz, Iran

[c] Faculty of Engineering and Applied Science, Memorial University of Newfoundland, St. John's, NL, Canada

ABSTRACT

The drilling industry is motivated to develop high performance clay swelling inhibitors with good biodegradability and low toxicity. In this study, the non-ionic surfactant glycyrrhizin was obtained as Glycyrrhiza Glabra root extract (GGRE) as a clay swelling inhibitor. The swelling inhibitive property of the biosurfactant was systematically evaluated through various experiments including mud making, filtration, shale cuttings recovery, sedimentation, scanning electron microscopy (SEM), and thermo-gravimetric analysis (TGA). We compare the performance of our surfactant with a synthetic surfactant (TX-100) and a commonly used clay inhibitor (KCl). Compared to the baseline swelling test without inhibitors, the aqueous solution of GGRE shows much more montmorillonite (Mt) loading capacity and fluid loss, less shale cuttings disintegration, unstable Mt dispersion, larger aggregated Mt particles, and lower Mt mass loss. The inhibitive performance of the GGRE was found to outperform that of the KCl. The results show that TX-100 does not provide inhibition. The compatibility with the drilling fluid formulation was investigated through the rheological and fluid loss analysis. GGRE is found to be compatible with the commercial drilling fluids additives. The inhibition mechanism was also investigated through wettability investigation and FT-IR analysis. The results show that GGRE can strongly reduce the hydrophilicity of Mt. From FT-IR spectra, the interaction between Mt and GGRE is obvious. Our results imply that GGRE possesses good inhibitive characteristic in hindering Mt swelling. The molecule of glycyrrhizin—the main component of GGRE—consists