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Impact of Degree of Dispersion of Graphene Nanoplatelets on Rheological Behavior of Water-Based Drilling Fluid

Syahrir Ridha^{1*}, Arif Ibrahim¹, Asna Amer² and Radzi Shahar¹¹Petroleum Engineering Department, University Technology Petronas, Malaysia²Centralized Analytical Laboratory, University Technology Petronas, Malaysia

Application of carbon nanomaterials in oil well drilling fluid has been previously studied and was found to enhance its filtration properties. It is under general consensus that addition of colloids in suspension will alter its rheology. Carbon nanomaterials, in this research work; graphene nanoplatelets is a hydrophobic material which has been previously studied to be enhance filtration properties of drilling fluid can be functionalized to improve its dispersion in aqueous solution. However, different method of functionalization may yield different degree of dispersion, thus varying rheological behavior of drilling fluid. The objective of this study was to characterize colloidal dispersion of graphene nanoplatelets (GNP) in aqueous solution and its impact on the rheological behavior of water-based drilling fluid. Dispersion of graphene nanoplatelets was achieved through non-covalent fictionalization by means of surfactant attachment. UV-visible spectroscopy was employed to analyze the dispersion of GNP in aqueous solution. Rheological test was carried out using a simple direct-indicating viscometer at six (6) different speeds. Results revealed that degree of dispersion of GNP using Triton X-100 was generally higher than both SDS and DTAB. Comparison between rheological behavior of drilling fluid with GNP dispersed using different surfactants shows that little to no difference at low shear rates. At high shear rates however, greater dispersion of GNP shows higher thinning properties while fluid with low dispersion of GNP exhibited linear behavior or thickening properties.

Biography:

Syahrir Ridha is an Associate Professor in University Technology Petronas' Petroleum Engineering Department where he has been a faculty member since 2014. He is currently the Master of Engineering in Drilling Engineering's Programme Manager. Ridha completed his Degree in Mining Engineering at University Islam Bandung in 2006. He then furthered his study with Master in Petroleum Engineering at University Technology Petronas. Ridha completed his PhD at University Technology Petronas in 2013. His research interest lies in the chemistry of fluids, ranging from cementing to oil-well drilling muds and nanotechnology. Ridha has collaborated with researchers in several other disciplines of engineering science particularly geology and analytical chemistry.