Sintesis, Karakterisasi, dan Uji Kinerja Sulfonated Graphene Oxide dan Sulfonated Reduced Graphene Oxide dari Limbah Grafit Baterai sebagai Aditif Fluida Pengeboran = Synthesis, Characterization, and Performance Test of Sulfonated Graphene Oxide and Sulfonated Reduced Graphene Oxide from Graphite Waste Batteries as Drilling Fluid Additives

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Abstrak

Limbah katoda grafit dari batu baterai Zinc-Carbon merupakan limbah beracun dengan jumlah melimpah dan menjadi permasalahan bagi lingkungan. Penelitian ini bertujuan untuk mensintesis senyawa sulfonated-GO dan sulfonated-rGO dari limbah grafit batu baterai serta mendapatkan pengaruh penambahan senyawa grafena hasil sintesis terhadap performa fluida pengeboran berbasis air. Purifikasi limbah grafit batu baterai dilakukan dengan teknik leaching asam-basa, sintesis grafena oksida dilakukan dengan metode Hummers termodifikasi, sintesis grafena oksida tereduksi dengan pereduksi asam askorbat untuk kemudian dilakukan rekasi sulfonasi untuk menghasilkan sulfonated-GO dan sulfonated-rGO. Dalam penelitian ini dilakukan variasi jumlah asam askorbat (rGO 1:1,5, rGO 1:2, rGO 1:2,5) dan jenis senyawa grafena yang ditambahkan pada formulasi fluida pengeboran. Dari ketiga variasi yang dilakukan, hasil rGO yang paling baik berdasarkan jumlah lapisan yang terkelupas, kandungan unsur C dan O adalah rGO 1:2,5 dengan jumlah lapisan 7, kandungan unsur C 88,54% dan kandungan unsur O 10,66%. Dalam penelitian ini mengkonfirmasi bahwa SGO dan SrGO terbentuk dengan adanya peak baru pada FTIR sekitar 1173 cm-1 dan 1124 cm-1, yang menunjukkan adanya ikatan S-O dan 1038 cm-1 menunjukkan adanya ikatan s-Phenyl dan terdapat atom S yang mana atom S sebagian besar berasal dari asam sulfanilat. SGO dan SrGO yang dihasilkan dari sintesis grafit dapat diaplikasikan sebagai aditif fluida pengeboran berbasis dan dibandingkan dengan aditif komersial.

.....Graphite cathode waste from Zinc-Carbon battery stones is toxic waste in abundance and is a problem for the environment. This study aims to synthesize sulfonated-GO and sulfonated-rGO compounds from graphite waste rock batteries and to obtain the effect of adding synthetic graphene compounds on the performance of water-based drilling fluids. Purification of battery rock graphite waste was carried out using acid-base leaching techniques, graphene oxide synthesis was carried out by the modified Hummers method, reduced graphene oxide synthesis with ascorbic acid reducing then carried out sulfonation reactions to produce sulfonated-GO and sulfonated-rGO. In this study, variations in the amount of ascorbic acid (rGO 1: 1,5, rGO 1: 2, rGO 1: 2,5) and types of graphene compounds were added to the drilling fluid formulation. Of the three variations carried out, the best rGO results were based on the number of layers peeled off, the elemental content of C and O was rGO 1: 2.5 with 7 layers, element C content was 88.54% and elemental O content was 10.66%. In this study, it was confirmed that SGO and SrGO were formed by the presence of new peaks on FTIR of around 1173 cm-1 and 1124 cm-1, which indicated that there were SO bonds and 1038 cm-1 indicated that there were s-Phenyl bonds and there were S atoms, which were S atoms. mostly derived from sulfuric acid. SGO and SrGO produced from graphite synthesis can be applied as drilling fluid based additives and compared with commercial additives.