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Prediction of frictional pressure losses while drilling for optimum equivalent circulating density

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A great challenge in the oil and gas drilling is the unstable nature of the Equivalent Circulating Density (ECD) of the drilling fluid. This is greatly affected by the Frictional Pressure losses incurred during the circulation of the given drilling fluid. To predict and control this problem, a research of this magnitude has been embarked upon and this work presents a simplified and accurate procedure which first selects the rheological model that best fits the rheological properties of the given fluid. This selection will then help to ensure an accurate calculation and prediction of the frictional pressure losses which will hence result to an optimized drilling process. The model which gave the lowest absolute average percent error (EAAP) between the measured and calculated shear stresses was the Herschel-Bulkley model (HBM) with EAAP of 2.178%, it also predicted the least frictional pressure losses at different flow rates, the API Power law model for pipe flow was next with 14%, but predicted higher losses than HBM and BPM, the BPM model gave 18.46%, etc. The accuracy of these results are of great importance for they help in computing correct results for pressure drop calculations and can be used for complex hydraulic calculations.

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Direct methane oxidation into value added chemicals

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The aim of this work is to find a new heterogeneous catalyst to convert the abundant methane gas in a direct route (one step) reaction into useful and transportable oxygenates using hydrogen peroxide as clean and efficient oxidation agent at mild conditions without using organic solvent. For this purpose, several catalysts have been selected and tested to oxidize methane to it's oxygenates using hydrogen peroxide as oxidation agent. These catalysts were; Al_2O_3, TiO_2, TS-1, H-ZSM-5, Al-MCM-41, Ti-SBA-15 and Ti-MCM-41. Surprisingly, among all these catalysts, H-ZSM-5 (25) zeolite catalyst showed high activity and very good selectivity. Methane conversion over H-ZSM-5 (25) catalyst was much higher than over all other catalysts. About 85 mole % formic acid selectivity (based on methane conversion) and about 78 mole % (based on H_2O_2 conversion) at 21 mole % methane conversion were achieved over the self-synthesized HZSM-5 catalyst having SiO_2/Al_2O_3=15 molar ratio. The by-product is only CO_2. From catalyst performance testing and characterization results, It concluded and proved that the Brönsted acid sites are the important and needed for this reaction.

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