UNIVERSITI TEKNOLOGI MARA

EFFECT OF DEMULSIFICATION ON ANIONIC SURFACTANT-STABILIZED OIL-IN-WATER EMULSION USING GRAPHENE OXIDE

NUR ARIFAH NABILA BINTI ZUKMI

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Faculty of Chemical Engineering

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ABSTRACT

Emulsion problem in oil and gas industry is a serious problem and need to be overcome. This is because formation of emulsion can cause problems such as production loss, pressure loss and tripping in production facilities. One of the best way to separate emulsion is by using demulsifier. Graphene Oxide (GO), due to its amphiphilic behavior had received attention as potential demulsifying agent. Synthesis of GO was done by using Hummer's modified method and was characterized by using X-Ray Diffractometer (XRD) and Fourier Transform Infrared Spectroscopy (FTIR). Result shows that GO was successfully obtained when XRD result shows peak of $2\theta = 10.02$ and FTIR result shows the presence of functional groups such as –OH, C=O and C-O. Synthetic oil using n-heptane and toluene was used to provide oil medium while SDS, an anionic surfactant was used to create emulsion. Performance of GO to break the emulsion was tested at different water cut of 1:1, 1:2, 1:3 and 1:4 and result shows that GO helps in increasing rate of separation with different water cut having their own optimum dosage of GO needed. GO was also tested at different pH condition and result shows that GO can perform well in acidic and neutral condition as had been predicted. On the contrary, although in alkali condition GO was predicted to be not effective, result had shown good reparation rate. However, result at alkali condition was believed to be affected by decrease in interfacial tension between water and synthetic crude caused by presence of SDS surfactant.

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TABLE OF CONTENT

CHAPTER 1

INTRODUCTION

1.1 INTRODUCTION

Emulsion is formed when there are two immiscible liquid, with one liquid being dispersed in another. This process of formation of emulsion is known as emulsification. The three main types of emulsion is oil-in-water (O/W) emulsion, water-in-oil (W/O) emulsion and multiple emulsion, such as water-in-oil-in-water (W/O/W) emulsion and oil-in-water-in-oil (O/W/O) emulsion. Emulsion problem in the oil and gas industry is something that has been receiving attention these days. This is because emulsion will lead to problems such as tripping of equipment in operation, pressure drops in flow lines (Sunil Kokal & Wingrove, 2000). This will indirectly increase operational costs thus formation of emulsion is not preferred.

Emulsion will only be formed under three conditions (1) two immiscible liquid is in contact (2) there are emulsifying agent in the system and (3) enough energy of agitation to disperse one liquid into another (Augustina & Sylvester, 2015). Without the presence of all three conditions, formation of emulsion is less likely to happen. The two methods of formation of emulsion are by mechanical means where the two liquids are violently mixed and chemical method whereby addition of chemicals into the system causes emulsion to be formed.

Stability of emulsion is affected by presence of stabilizing agents. These stabilizing agents are also known as surfactant. Surfactant is the short term of 'surface active agent' whereby they contain both hydrophilic head and hydrophobic tail. Emulsion stability was promoted by emulsifier lowering interfacial tension between two liquid phases, causing the droplets to stabilize and preventing them from coalescing. There are two mechanisms proposed for stabilization of emulsion that are (1) steric stabilization and (2) electrostatic stabilization.