

**UNIVERSITI TEKNOLOGI MARA**

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

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## ABSTRACT

Graphene oxide (GO) is an amphiphilic material capable of breaking oil-in-water emulsion at room temperature. In the oil and gas industry, emulsions formation in the pipeline is a problem as emulsion will have negative effects or problems to the processing plant. The existence of emulsions in the crude oil will reduce the quality of the crude oil itself, increase the cost of operating due to emulsion separation as well as causing corrosion problem to the flowlines and transport system. Chemical demulsification are widely being used in the industry to treat oil-in-water emulsion which involves the use of chemical additives to rapidly enhance the emulsion breakdown process. Hummer's method was used and successfully synthesized graphene oxide from graphite powder through strong oxidation process. Characterization of the GO produced was done using FTIR and XRD. Result shows various functional groups peaks produced in the graphene oxide in comparison with the originally used graphite powder. The XRD test also produced positive result as it gives similar result of  $2\theta = 10.26^\circ$  in theory. The performance of GO on separation of cationic surfactant stabilized emulsion was assessed experimentally. Results shows that GO successfully improves the demulsification process even under acidic condition but had a decrease in performance under alkaline condition.

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## **TABLE OF CONTENT**

|                                         |             |
|-----------------------------------------|-------------|
| <b>AUTHOR’S DECLARATION</b>             | <b>II</b>   |
| <b>SUPERVISOR’S CERTIFICATION</b>       | <b>III</b>  |
| <b>ABSTRACT</b>                         | <b>IV</b>   |
| <b>TABLE OF CONTENT</b>                 | <b>VI</b>   |
| <b>LIST OF FIGURES</b>                  | <b>VIII</b> |
| <b>LIST OF TABLE</b>                    | <b>IX</b>   |
| <b>INTRODUCTION</b>                     | <b>1</b>    |
| <b>1.1 Research Background</b>          | <b>1</b>    |
| <b>1.2 Problem Statement</b>            | <b>2</b>    |
| 1.2.1 Toxic Materials                   | 2           |
| 1.2.2 High Viscosity                    | 3           |
| 1.2.3 Increase Production Cost          | 3           |
| <b>1.3 Objectives</b>                   | <b>4</b>    |
| <b>1.4 Scope of Work</b>                | <b>4</b>    |
| <b>LITERATURE REVIEW</b>                | <b>5</b>    |
| <b>2.1 Emulsion</b>                     | <b>5</b>    |
| <b>2.2 Emulsion Stability</b>           | <b>6</b>    |
| 2.2.1 Interfacial film                  | 6           |
| <b>2.4 Emulsifying Agent</b>            | <b>7</b>    |
| 2.4.1 Surface-active agent (surfactant) | 7           |
| 2.4.2 Type of Surfactants               | 8           |
| 2.4.2 Fine solids                       | 10          |
| <b>2.5 Demulsification</b>              | <b>12</b>   |
| 2.5.1 Flocculation (Aggregation)        | 13          |
| 2.5.2 Coalescence                       | 13          |
| <b>2.6 Nanotechnology</b>               | <b>14</b>   |

## CHAPTER ONE

### INTRODUCTION

#### 1.1 Research Background

An emulsion is a stabilized mixture of two or more immiscible liquid, for example oil and water. Emulsion can be difficult to treat and can cause several operational problems in wet-crude handling facilities and also during separation process on surface facilities. Since oil is co-produced with water, it is very likely that formation of emulsion can occur along the production flowlines. The formation of emulsion occur due to the presence of oil and water in a single flowline along with the agitation caused when both of the liquid runs through the flowline. Apart from that, emulsion was also form due to the depletion in differential pressure. This phenomenon occur when the liquid exit the wellbore and onto to the surface. As the formation of emulsion occur, it will significantly reduce the differential pressure in the flowline and also slowdown the production. An Emulsion has a higher viscosity compared to when the liquid are in their original phase. These will lead to an increase in the use of demulsier and sometimes cause trip or upset in wet-crude handling facilities. (Mohsin & Meribout, 2015)

An emulsion has a few different type depending on the water-cut of the reservoir. The first type is water-in-oil (o/w) emulsion. W/o emulsion occur when the water cut is less than 80% of the reservoir. Next is the oil-in-water (o/w) emulsion which occur when the water cut is in between 80% to 95% of the reservoir. A much more complex form of emulsion is the water-in-oil-in-water (w/o/w) emulsion that normally occur at the end of the field life time where the production oil of is low and the water cut is more than 95% of the reservoir. This studies focus on the separation of o/w emulsion due to the fact that right now many of the reservoir worldwide are already old and the water-cut is high. Apart from the types, an emulsion also vary in stability depending on the emulsifying agent presence inside the emulsion. The stability of emulsion also affected temperature, pH, and also solid particles which sometime carried over during the production process. Failure of breaking the emulsion