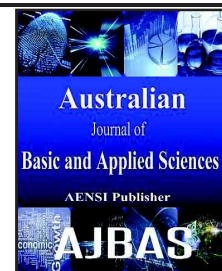




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Demulsification of Water-in-Crude Oil Emulsion via Conventional Heating and Microwave Heating Technology in their Optimum Conditions

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ABSTRACT

A serious problem during the production and refinery process of crude oil is the existence of emulsified water in the crude oil. From the economic and environmental points of view, water must be removed from the crude oil before going for further processing. In the last two decades, several demulsification techniques have been applied by many researchers. Since, the best method is based on the best water separation efficiency. Therefore, a comparative study between microwave heating and conventional heating demulsification in their optimum conditions has been carried out. Both methods were performed with the assistance of chemical demulsifier. Through the experimental results, it was found that comparing to the conventional heating; microwave dielectric heating earned the best separation efficiency (100 %) in a short time. The optimum condition in microwave dielectric heating was achieved at the irradiation time (3 minutes), microwave power (360 watt), and 2.50 vol. % demulsifier concentration. However, in conventional heating using "hotplate" the highest separation efficiency (96 %) was obtained at 160 °C, and heating time 5 minutes.

INTRODUCTION

Demulsification is a process of water and oil separation from the emulsion, which is a very important step in petroleum industries. A critical problem in petroleum field is the resulting stabilization of water-in-crude oil (W/O) emulsion, which can cause many problems during the storage and refining process (Mohammed & Mohammed 2013). More than 95% of the crude oil emulsions formed in the oil fields are the W/O type (Ali and Alqam, 2000). The presence of natural surfactants such as resins and asphaltenes, adsorb at the interfaces and finally create stable crude oil emulsions. Emulsified water may cause many problems at several stages of crude oil productions such as, increasing the oil viscosity, high cost of pumping and transportation, equipment corrosions, and in some cases the poisoning of refinery catalysts (Kanicky *et al.*, 2001; Alwadani, 2009; Hasan *et al.*, 2010). Therefore, the emulsions of W/O must be treated. The traditional methods of crude oil emulsion demulsification including physical and chemical treatments such as, chemical demulsifiers, heating, electrical, and mechanical methods have been widely used in industries which have along some disadvantages. (Abdulbari *et al.* 2011) and (Martínez-Palou *et al.* 2013), found through their laboratory experiments that microwave dielectric heating technology has a greater influence on the separation efficiency comparing to the conventional heating. Relatively, (Tan, 2007) and (Issaka *et al.* 2014) also conducted an experiment on demulsification of W/O emulsion via microwave-assisted chemical demulsification technique. The results of their studies indicated

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