UNIVERSITI TEKNOLOGI MARA

SYNTHESIS OF ZNO NANOPARTICLE FOR WAX DEPOSITION CONTROL AND OIL UPGRADING: EFFECT OF RATIO OF ZINC ACETATE DIHYDRATE TO OXALIC ACID DIHYDRATE

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ABSTRACT

In the current paper, fundamental aspects of heavy oil and wax deposition problems are defined. Wax or in another term is cloud point occur when the oil starts to precipitate. When it's started to precipitate, it can cause major problem to industry of oil and gas. In this study, ZnO nanoparticles were chosen to study the effect of varying molar ratio from 1:1, 1:2, 1:3 to the morphology and size of the nanoparticle. The structures and properties were recognized with energy dispersive X-ray (EDX), field emission scanning electron microscopy (FE-SEM), and X-ray diffraction (XRD) methods. EDX and FE-SEM is to study the morphology of ZnO structure while XRD is to determine the purity and size of the nanoparticle. From the study, 1:1 ratio has the smallest size of nanoparticle with 10.37 nm while 1:2 and 1:3 give the size of 12.3 nm and 16.37 nm respectively. As the molar ratio is increases, the size of nanoparticle become bigger. The influenced of ZnO nanoparticles on rheological behavior of model oils and the wax content is reported. From the study, the addition of ZnO nanoparticle reduced the rheology behavior of crude oil by varying nanoparticle sizes, temperature and shear rate. ZnO nanoparticle can reduce the deposition of wax up to 50% with influenced of smaller nanoparticle size. Effect of size of nanoparticle highly impact the viscosity and wax content. This prove that, by introducing nanoparticle into crude oil, wax content can be reduced thus decrease the chance for crude to precipitate.

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CHAPTER ONE
INTRODUCTION

1.1 Research Background

Currently, there is no hesitation on the demand of energy become the challenge for the world to meet. This challenge is caused due to several factors such as enormous of growth population, competing demands from variety of users, and increasing technical development and living standard. Due to these factors, the alternative energy is needed to look for to overcome the lack of energy from conventional energy. Numerous alternative energy has been introduce including solar energy, wind, geothermal, hydropower, bioenergy and ocean power. Although the introduced energy is claim it is environmentally-friendly unit, the cost is much expensive and inadequately to meet the demands.

In the recent past, the discoveries of transition from microparticles into much smaller particles widely used in various of industry. The result from the usage of nanoparticle formed the new field in science and technology. Nanoscience and nanotechnology are the field formed from the emerging of nanoparticle application in the industry. Nanotechnology take place in the trend as an alternative to help in increasing the production of oil due to the potential application and benefits. The application of nanotechnology has risen in the oil and gas industry due to many researchers have been study and investigating in this area for the past few years.

With the size of nanoparticle range between 1-100nm, nanoparticle has their own unique properties such as greater surface area per unit volume which resulting in higher reactivity towards another molecule. According to (Fakoya and Shah 2017), they reported that more a nano-sized particle has more than million in surface area to volume ratio when converting from millimetre scale.