1. INTRODUCTION

Since the 1850’s, petroleum has been the most significant fuel and energy supply since the 1850s and accounts for nearly 90% of the vehicle fuel consumed. Need is met by oil. In any case, there has been increasing concern about a potential energy crisis triggered by the imminent depletion of oil. Researchers have driven to seek alternative and sustainable energy sources to reduce their dependence upon petroleum. The need for increased energy security and their concern about the continuously rising cost of high oil costs have driven researchers to seek for renewable and sustainable energy sources to overcome the reliance on petroleum.

Besides, green and ecologically benign fuels also have an effect on fossil fuel gas emissions from fossil fuels and the environmental pollution issues. The importance of these issues are also the important reasons for green and ecologically benign fuels. Biodiesel has become a very viable substitute for fossil diesel, with similar characteristics to fossil diesel, and has become world-wide. Thus, biodiesel has more advantages, some of which are compared with the conventional fossil diesels are their renewability, biodegradability, non-toxicity and low exhaust emissions due to the absence of sulphur and aromatics in biodiesel. Researchers have studied investigated the utilization of industrial processes to substitute fossil diesels.

Technically, the term “biodiesel” refers to mixtures of fatty acid alkyl esters (FAAE) mixtures, produced by the transesterification of vegetable oils or animal fats with alcohol or through the esterification of free fatty acids (FFA) with alcohol. In this transesterification reaction, both acid and base catalysts can be used to increase the biodiesel production during the transesterification process. Biodiesel has seen a significant increase globally in the 21st century because of the aforementioned experienced a major surge worldwide due to these advantages.

In the acid-catalyzed transesterification process, typically, strong acids such as hydrochloric acid and phosphoric acid usually serve as catalysts in the acid-catalyzed transesterification process (Melero et al., 2015). As the acid catalysts are more corrosive, it is not preferred due to the high operating costs in of the industrial process. The importance of solid base catalysts is recognized, and come to be known for their environmentally-friendly qualities. Typically, metal oxides are identified as the most commonly significant and extensively used as catalysts in this industry. A strong basic metal oxide can be developed strength can be formed after from high-temperature treatment applied in order to obtain a carbonate-free metal oxide surface (Yacob et al., 2014). In this research, zinc oxide (ZnO) which is inexpensive and reusable was used as a catalyst. In this work, besides ZnO has been commonly generally used as a catalyst support and when and it has been established that impregnated with alkaline metals,
ZnO is considered to be a good basic and solid catalyst for the transesterification of vegetable oils (Alba-Rubio et al., 2010). According to Dantas et al., (2017), the spinel-type of heterogeneous catalysts offer more advantages because of their great cationic mobility. This is due to the original crystalline structure, that which could make it easier to substitute chemical elements with other elements of the same structure in terms of electronegativity, valence and radius size, with other elements of the same structure.

As compared to other metals, therefore, the doping with Cu significantly strengthened the properties of catalytic processes, provided significantly in contrast with other metals improvement of properties in the catalytic processes. Ni catalysts, for example, were efficient in catalytic processes due to the high abundance of Ni, but Ni was found to have low corrosion resistance due to the acidity of bio-oil, which could potentially affect its activity and stability during the process. For example, Ni catalyst were efficient in catalytic processes due to the great abundance of Ni, however, it was found that Ni exhibited low corrosion resistance due to the acidity of the bio-oil, and this might affect its activity and stability during the process (Ambursa et al., 2016). The combination mixture of Cu and Zn was used to achieve high versatility in the properties of these materials. The catalytic activity of the binary catalyst, Cu/ZnO, has been reported to be several orders of magnitude greater than that of either metallic Cu or pure ZnO, thus suggesting a synergetic interaction between two components (Kasatkin et al., 2007). A strong interaction between the metal and the support has been known to cause a strain in the metal particles, which attributed to the improved overall catalytic performance. On the other hand, the addition of copper dopant into a single metal oxide could increase the surface basic properties. It has been reported that supporting the metal oxides on high surface area materials, γ-Al2O3 is a promising approach to increase the stability of the resultant catalysts for supporting the metal oxides on high surface area materials. The high surface area of the supporting material was crucial for the dispersion of the catalytically active metal, and improved catalyst recovery after the reaction (Sulaiman et al., 2017).