



Assessment of Physical, Chemical, and Tribological Properties of Different Biodiesel Fuels

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14.1 INTRODUCTION

Biodiesel is a renewable energy source that offers some benefits including the reduction in greenhouse gas emission and pollutants, increasing energy diversity and economic security [1]. Biodiesel is considered as a promising alternative fuel for transportation sector as it has similar fuel properties with diesel fuel [2]. It also can be blended with diesel fuel at any percentage and can be used for power generation in a diesel engine without the change of existing infrastructure. The source-to-wheel carbon dioxide emission analysis of pure biodiesel fuel shows that it reduces 60% CO emission to the environment compared to conventional fossil fuel [3]. In this context, different countries have set their target and mandate to use biodiesel fuel in the transportation sector. For example, the European Union has a target to use 10% biodiesel and China has a target to use 10.6–12 million biodiesel by 2020. Similarly, the Australian government has also set a target to use 20% biodiesel by the year of 2020 [4]. As a result, worldwide biodiesel production has increased too. According to the BP statistics 2015, 10.3% global biodiesel production increased in 2014 compared to the year of 2004.

Biodiesel consists of long-chain alkyl ester and is produced from vegetable oils, animal fats, or waste cooking oils through transesterification reaction [5,6]. In transesterification reaction, vegetable oils are reacted with alcohol (usually methanol) in the presence of a catalyst (commonly used, KOH and NaOH). Through the reversible reaction, triglycerides are converted into monoglycerides, and glycerin is obtained as a by-product. The transesterification reaction is shown in Fig. 14.1.

One of the outstanding credit of biodiesel compared to other biofuels is that a wide range of biodiesel feedstocks are available around the world [7]. Most of the countries use the source for biodiesel production that is readily available in their country. For example,