A REVIEW ON THE THERMAL LIQUEFACTION PROCESS OF POLYSTYRENE (PS) WASTE IN BIO-FUELS PRODUCTIONS

AMIRATUL HANIM BINTI MOHD ZAMRI

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ABSTRACT

A REVIEW ON THE THERMAL LIQUEFACTION PROCESS OF POLYSTYRENE (PS) WASTE IN PRODUCTION OF BIO-FUELS

The use-and-throw culture of plastic products has generated a massive amount of plastic wastes each year, posing a threat to the environment with the absence of proper disposal methods of the wastes. Polystyrene (PS) is a thermoplastic polymer with low weight, low thermal conductivity, low cost, and low water absorption. These makes PS became favourable to be used especially for packaging. Nonetheless, these good characteristics have made it a less attractive target for recycling. Thermal liquefaction technology has emerged to become one of the alternatives in reducing the number of accumulated wastes while simultaneously generating valuable liquid products or biofuels for applications such as chemical feedstock in industries. This study is reviewing on the thermal liquefaction of PS waste for bio-fuels production focusing on the effect of reactor, temperature, pressure, solvent, and the reaction time. Based on the studies reviewed, it was observed that the aforementioned parameters give a big effect on the quantitative and qualitative aspect of the product yield. The reactor that most of the researcher use for this process is autoclave batch reactor as it can produce a high conversion of feedstock. The oil yield increased when the temperature and the pressure increase as more kinetic energy at a higher temperature assist in breaking the big polymer into a smaller hydrocarbon. In term of solvent usage, organic solvent gives a better oil yield than water because of its ability to improve the mass and heat transmission. Finally, the conversion of PS waste into liquid were increasing along the reaction time in influence of temperature. The physical and chemical properties of the oil from PS liquefaction contain aromatics, alkenes, and alkanes compound. The liquefaction oil's calorific values are also generally found to be between 40-45 MJ/kg.

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CHAPTER 1

INTRODUCTION

1.1 Background of study

Solid waste management (SWM) is an important component of a comprehensive environmental management strategy. The main purpose of SWM is reducing and eliminating adverse impacts of waste materials on human health and the environment to improve economic development and superior quality of life. Based on environmental rules, SWM procedures are being updated to make SWM more feasible and successful, as well as to develop sustainability based on the reduce, reuse, and recycle (3R) principles (Das *et al.,* 2019).

SWM is a multifaceted topic with numerous technological, sociological, ecological, and political issues. Due to significant population growth, unplanned and quick urbanization, and serious health problems caused by insufficient public services, SWM is considerably more serious in the developing nations (Bui *et al.,* 2020). SWM is an autonomous procedure that is mostly determined by each country's economic situation. Regardless