1. Abstract

76% of all waste plastics end up in landfills, whether they were meant to be recycled or not. 15% are burned for thermal energy, releasing toxic emissions into the atmosphere. 9% are mechanically recycled (Anshassi et al., 2019). The process of mechanical recycling is environmentally damaging in itself, requiring transportation and mechanical processes that emit carbon (Andres et al., 2012). Hydrothermal liquefaction allows for waste plastics to be turned into energy-rich biocrude oils that can be used for commercial reasons. However, hydrothermal liquefaction of polystyrene–one of the most common consumer plastics on the market–requires a high temperature of 350ºC and a processing time of almost 4 hours for a small amount of oil. The use of the oxidant hydrogen peroxide in HTL of polystyrene has been promising as it is able to lower the required temperature to run the process as well as increasing the oil yield to about 80%wt (Ahmad et al., 2020). However, it is unknown why hydrogen peroxide is capable of working so well. Analysis of just using styrene and hydrogen peroxide showed that once heated, styrene is mostly unable to polymerize, creating more oil and less solid waste. Additionally, hydrogen peroxide and styrene create a compound called Ethanone, 1-(3-amino-4-methoxymethyl-6-methylthieno[2,3-b]pyrid-2-yl)-, which is oxidized. Now that it is known that hydrogen peroxide is capable of inhibiting polymerization and oxidizing styrene, creating new products, the process of HTL with hydrogen peroxide can be adjusted. In the future, researchers can wait until polystyrene has fully depolymerized before adding hydrogen peroxide, increasing oil production and decreasing solid waste.