PYROLYSIS-CATALYSIS OF WASTE PLASTICS TO PRODUCE HIGH VALUE FUEL AND AROMATIC COMPOUNDS

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Plastic production over the years has increased due to high demand and its uses in various fields. In Europe, about 25 million tonnes of waste plastics are produced annually. Due to the properties of plastics such as the ease of production, durability and its wide application, plastics have made the waste management system problematic. Pyrolysis-Catalysis of the waste plastic have provided the avenue of converting these waste into valuable fuel and chemicals which still remain a novel alternative option for processing waste plastics. This study undertakes the conversion of waste plastics to high value fuel and aromatic compounds in the presence of novel catalyst using two stage fixed bed reactor. Catalyst used were metals supported on Y-zeolite, these metals include nickel, molybdenum, iron, ruthenium, gallium and cobalt. Other influencing process parameters such as catalyst temperature and plastic: catalyst ratio was also examined in order to optimise fuel properties and aromatic production. The product oil and gases were analysed using gas chromatograph (GC) and gas chromatograph mass spectroscopy (GC-MS). The catalysts were analysed using Brunauer-Emmett-Teller (BET), while reacted catalysts were characterised using temperature programmed oxidation (TPO) and scanning electron microscopy (SEM). The results showed that the use of different metals and manipulation of the process conditions immensely increase the yield and quality of fuel and aromatic production.

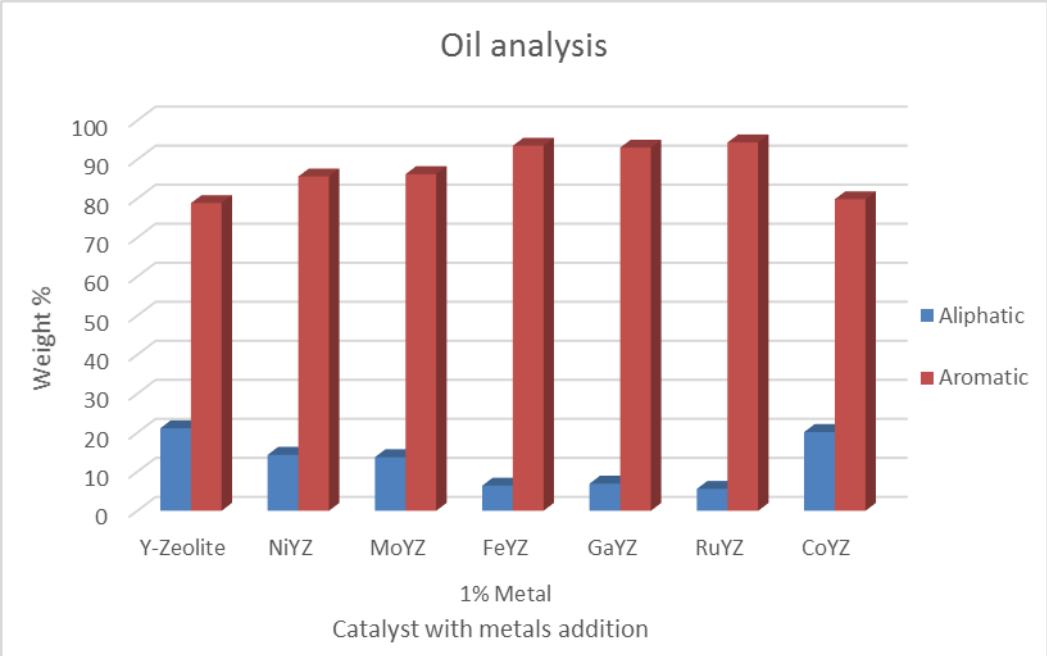

Figure 1. Illustration of typical aliphatic and aromatic production from pyrolysis-catalysis of high density polyethylene (HDPE) in a two stage fixed bed reactor.