



## Production of Lubricating Base Oil from Plastic Pyrolysis: Preliminary Study

Chanathip Thumcharoen<sup>1</sup>, Vituruch Goodwin<sup>2</sup>, Yatika Somrang<sup>2\*</sup>

<sup>1</sup>*Department of Chemical Engineering, Faculty of Engineering, King Mongkut's University of Technology Thonburi, Thailand*

<sup>2</sup>*National Metal and Materials Technology Center, Thailand*

\*e-mail: yatikas@mtec.or.th

Recent works have focused on pyrolysis of plastic waste to transportation fuels. However, other high-value products from plastic pyrolysis have rarely been investigated. Production of lubricating base oil which is more costly than fuels, thus, was examined in this work. Four types of plastic were selected, i.e. polypropylene (PP), high-density polyethylene (HDPE), low-density polyethylene (LDPE) and polystyrene (PS). The effect of temperature and refinery catalysts (CoMo A, CoMo B and FCC) on yield and product distribution was studied. Pyrolysis-gas chromatography mass spectrometry was employed to pyrolyse plastic and characterise volatile products. Results show that high temperatures cause an increase of olefins which are undesirable components in base oil. The C<sub>19</sub>-C<sub>40</sub> fraction suitable for the base oil production was considerably present in volatiles from HDPE, LDPE and PP pyrolysis at 400°C, i.e. 96.90wt%, 95.57wt% and 74.68wt%, respectively, whereas only 8.66wt% was found in PS product. In addition, the C<sub>19</sub>-C<sub>40</sub> fraction from HDPE and LDPE degradation at 400°C is comparable to the base oil group III which mainly contains paraffins and naphthenes, i.e. 69.94wt% and 65.37wt% paraffins as well as 5.03wt% and 8.46wt% naphthenes, respectively. The presence of catalysts contributes to an increase of light hydrocarbons, olefins and aromatics.

**Keywords:** Plastic pyrolysis; Lubricating base oil; Polypropylene; High-density polyethylene; Low-density polyethylene; Polystyrene; Pyrolysis-gas chromatography mass spectrometry; Refinery catalysts