

Synthesis and characterization of polyurethanes from residual palm oil with high poly-unsaturated fatty acid oils as additive

ABSTRACT

In the effort to produce renewable and biodegradable polymers, more studies are being undertaken to explore environmentally friendly sources to replace petroleum-based sources. The oil palm industry is not only the biggest vegetable-oil producer from crops but also one of the biggest producers of residual oil that cannot be used for edible purposes due to its low quality. In this paper the development of biopolymers from residual palm oil, residual palm oil with 10% jatropha oil, and residual palm oil with 10% algae oil as additives were explored. Polyols from the different oils were prepared by epoxydation with peroxyacetic acid and alcoholysis under the same conditions and further reacted with poly isocyanate to form polyurethanes. Epoxidized oils, polyols and polyurethanes were analyzed by different techniques such as TGA, DSC, DMA, FTIR and H-NMR. Overall, although the IV of algae oil is slightly higher than that of jatropha oil, the usage of algae oil as additive into the residual palm oil was shown to significantly increase the hard segments and thermal stability of the bio polyurethane compared to the polymer with jatropha oil. Furthermore, when algae oil was mixed with the residual palm oil, it was possible to identify phosphate groups in the polyol which might enhance the fire-retardant properties of the final biopolymer.

Keyword: Bio-based polyurethanes; Jatropha oil; Algae oil; Recovered palm oil