

**SYNTHESIS OF RIGID POLYURETHANE FOAM FROM  
WASTE COOKING OIL-BASED POLYOL USING  
TRANSESTERIFICATION REACTION AND COCONUT HUSK  
ACTIVATED CARBON AS ADSORBENT**

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## **ABSTRACT**

### **SYNTHESIS OF RIGID POLYURETHANE FOAM FROM WASTE COOKING OIL-BASED POLYOL USING TRANSESTERIFICATION REACTION AND COCONUT HUSK ACTIVATED CARBON AS ADSORBENT**

An investigation to determine physical and chemical properties of rigid polyurethane (PU) foam from waste cooking oil (WCO) was carried out. The WCO was adsorbed by using prepared coconut husk activated carbon adsorbent. Percentage of free fatty acid (%FFA), acid value and viscosity of the adsorbed WCO was determined to be 1.4%, 2.786 mg KOH/g and 97.8 mPa.s respectively. WCO based-polyol was synthesized through transesterification reaction to yield alcohol (OH) groups in the WCO chains structure. The WCO-based polyol was successfully synthesized due to the presence of O-H, C-H, C=O and O=C=N- functional groups. %FFA, acid value, hydroxyl value and viscosity of the WCO-based polyol was found to be 1.5%, 2.985 mg KOH/g, 46.2 mg KOH/g and 155.0 mPa.s respectively. Rigid PU foam prepared from WCO-based polyol resulting in PU with density of 208.4 kg/m<sup>3</sup> with maximum compressive strength and load at 0.03 MPa and 0.09 kN respectively. The presence of -NH<sub>2</sub> amide, -CH<sub>3</sub> and -CH<sub>2</sub>, -N=C=O and C-O-C functional groups revealed that WCO-based PU was successfully synthesized. The optimum composition used for rigid PU foam formation was at ratio 90 polyester polyol: 60 glycerol: 54 water (H<sub>2</sub>O): 40 diethylene amine (DEA): 23 2,4 methylene diphenyl diisocyanate (MDI). The foaming behavior for cream time, gel time, rise time and tack-free time for this ratio was recorded at 4, 24, 58 and 723 seconds respectively.