

## **An upgraded bio-oil produced from sugarcane bagasse via the use of HZSM-5 zeolite catalyst**

### **Abstract**

The pyrolysis upgrading of bio-oil from sugarcane bagasse (SB) using ZSM-5 zeolite catalyst was carried out in a fixed bed reactor to determine the effects of heating rate, temperature, and catalyst/biomass ratio on yield of bio-oil and their chemical compositions. Proximate analysis indicated that SB has 13.2% moisture content. The ultimate analysis carried out established that the percentage of carbon content is higher (48.2%) than oxygen content (44%) while the fibre content analysis showed 26.4% lignin, 33.3% cellulose, 30.1% hemicellulose. The heating rate, temperature and catalyst/biomass ratio were varied in the range of 10–50 C/min, 400–600 C and 0.05–0.25 respectively. The non-catalytic pyrolysis gave the maximum percentage yield (45.67 wt%) of bio-oil at a pyrolysis temperature of 600 C, heating rate of 50 C/min, sweeping gas flow rate of 40 mL/min and the catalytic pyrolysis gave 40.83 wt% of bio-oil at the same conditions. The FT-IR spectra showed that the non-catalytic bio-oil is dominated by oxygenated compounds (acids, ketones, aldehydes, alcohols), while the catalytic bio-oil had preponderances of desirable compounds (alkanes, alkenes, aromatics, phenols). The chemical composition of the bio-oils was analyzed using GC–MS, which revealed that the quality of the bio-oil has been improved using HZSM-5 catalyzed pyrolysis.