Esterification of residual palm oil using solid acid catalyst derived from rice husk

ABSTRACT

In this study, carbon-silica based acid catalysts derived from rice husks (RH) were successfully synthesised using microwave (MW) technology. The results showed that MW sulphonation produced Sulphur (S) content of 17.2–18.5 times higher than in raw RH. Fourier-transform Infrared Spectroscopy (FTIR) showed peak at 1035 cm^{-1} which corresponded to O=S=O stretching of sulphonic (-SO_3H) group. XRD showed sulfonated RH catalysts (SRHCs) have amorphous structure, and through SEM, broadening of the RH voids and also formation of pores is observed. RH600 had the highest surface area of 14.52 m^2/g. SRHCs showed high catalytic activity for esterification of oleic acid with methanol with RH600 had the highest initial formation rate (6.33 mmol L^{-1} min^{-1}) and yield (97%). The reusability of the catalyst showed gradually dropped yield of product for every recycle, which might be due to leaching of –SO_3H. Finally, esterification of oil recovered from palm oil mill effluent (POME) with methanol achieved a conversion of 87.3% free fatty acids (FFA) into fatty acid methyl esters (FAME).