Title
Esterification of palm fatty acid distillate (PFAD) catalyzed by heterogeneous acid catalysts

Research Abstract
Depletion of fossil fuel and the increase of environmental concern have urged the search for alternative fuel source. Biodiesel is one of the most promising substitutes that had been gaining much attention recently. The major drawback of biodiesel is the high cost of production making its non-economically viable. In the present study, biodiesel will be produced from low cost feedstock of palm fatty acid distillate (PFAD) using three types of catalyst (Al₂O₃-SO₃H, SiO₂-SO₃H and TiO₂-SO₃H). These catalysts are prepared by sulfonating aluminium oxides, titanium (IV) oxides and silicon dioxides with sulphuric acid. The most promising catalyst is screened based on the maximum biodiesel yield achieved in the shortest reaction time. The esterification process will be carried out at 80 °C, 20:1 methanol to PFAD molar ratio and 2 wt% of catalyst. Process optimization will be carried out to define the optimum immersed time and the optimum acid concentration which will result in good catalyst with desired characteristics using experimental design. Characterizations of these catalysts will be done by examining the catalysts using Scanning Electron Microscope with X-ray energy dispersive spectra (EDX), X-ray Diffractometer (XRD), Fourier Transform Infrared (FTIR), Brunauer, Emmett and Teller (BET) surface area measurement. The catalytic activity on esterification of PFAD will be studied based on the biodiesel yield analyzed using Gas Chromatography (GC). The most promising catalyst can be successfully screened to achieve maximum biodiesel yield. Furthermore, appropriate process optimization study that affected the biodiesel production can be defined via the esterification of PFAD.