

## **Production of biodiesel from mixed waste vegetable oils using Ferric hydrogen sulphate as an effective reusable heterogeneous solid acid catalyst.**

### **ABSTRACT**

Biodiesel production by simultaneous esterification and transesterification of waste oil with methanol has been studied in a heterogeneous system using solid ferric hydrogen sulphate [Fe (HSO<sub>4</sub>)<sub>3</sub>] acid catalyst. The catalyst was prepared by displacement reaction followed by calcination at 400 °C for 3 h. The prepared catalyst was characterized using X-ray diffraction (XRD), Fourier transform infrared spectrometer (FT-IR), Brunner-Emmett-Teller surface area measurement (BET), thermal gravimetric analyzer (TGA) and temperature-programmed desorption of NH<sub>3</sub> (TPD - NH<sub>3</sub>). Furthermore, the dependence of the conversion of mixed waste oil on the reactions variables such as the molar ratio of methanol/oil, the amount of catalysts used, reaction temperatures, reusability were also investigated. The catalyst was reused many times with slight loss in activity and the maximum yield of 94.5% was achieved at the optimized conditions of reaction temperature of 205 °C; stirring speed of 350 rpm, 1:15 molar ratio of oil to alcohol and 1% w/w catalyst loading.

**Keyword:** Biodiesel; Ferric hydrogen sulphate; Esterification; Transesterification; Mixed waste vegetable oil; Reusable