

Efficient reaction for biodiesel manufacturing using bi-functional oxide catalyst

Abstract

The search for biofuel in order to complement the future shortage of fuels and mitigate the poisonous air and water pollution has become so considerate in the last few decades. The choice of feedstock and catalyst system for biofuel production has been very difficult considering many drawbacks from food-fuel competition to catalyst separation and water washing after the reaction. To address these issues, acid-base bi-functional catalysts and waste based vegetable oil were considered for the sustainable production of biofuels. Bifunctional catalyst has the capacity to successfully transform waste based vegetable oil into useful biofuel under mild reaction parameters. In this work, a newly developed bimetallic tungsten- zirconia (W–Zr) modified waste shell catalyst samples were employed for the simultaneous esterification and transesterification of unrefined palm-derived waste oil (PDWO) to biodiesel in one-pot reaction. These catalysts were successfully synthesized using simple wet impregnation technique and characterized by SEM, BET, XRD, and TPD characterization techniques. The catalyst was able to achieved the maximum biodiesel yield of 94.1% in 1 h under optimized reaction parameters.