

Preparation of Green Nano catalyst and Its Application in Biodiesel Production from *Melia azedarach* Seed

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Biodiesel is a sustainable fuel which is often made from vegetable oils and animals fats. In this study, oil extraction and its conversion into biodiesel is done by transesterification using nanocatalyst. The solvents n-hexane for oil extraction was used on nonedible seed oil like *M. azedarach* for further analysis and investigations. The impact of oil to methanol molar ratios (1:3, 1:6, 1:9 and 1:12) at varied temperatures (70, 80, 90, 120 and 140° C), catalyst amount (0.3, 0.5, 0.7, 0.9 and 1g) and reaction temperature (1hr, 2hrs, 3hrs and 4hrs) were analyzed. *Melia azedarach* yielded 93% biodiesel in 1:12 molar concentrations and 80°C temperature with 0.7g of catalyst amount in three hours. The synthesized biodiesel was characterized using FTIR technique which confirmed synthesis of biodiesel. For nanoparticle characterization X-ray diffraction, FTIR, and scanning electron microscopy were performed on synthesized TiO₂ nanoparticles. These findings confirmed that the selected nonedible seed oil “*Melia azedarach*” can be used as a sustainable energy source for commercial/ industrial scale production of biodiesel.