National Institute of Technology Rourkela

Departmental Seminar

Seminar Title	: Conference Return Seminar on Biodiesel Production from the Blend of edible Sunflower and Coconut oil via Homogeneous Transesterification: A Physio-Chemical Evaluation (Presented at International Conference on Sustainable Energy and Environmental Challenges, 13-15 Dec 2024, IIT Mandi, HP, India)
Speaker	: Mr. Surya Pattnaik (Phd, Roll No. 521ch1003)
Supervisor	: 9124216744
Venue	: New Seminar Hall, Chemical Engg. Department
Date and Time	: 19 Dec 2024 (11.30 A.M.)
Abstract	: The global demand for sustainable and renewable energy has led to increased interest in biodiesel as an alternative to fossil fuels. The primary sources are edible and non-edible oil which are already been explored and exhibited positive results in biodiesel production whereas among these two choices edible oil-based biodiesel products are better in terms of yield and properties. There has always been a debate on food versus fuel context for which blending of oils can be a feasible approach to meeting renewable energy goals, with the potential to reduce the dependency on individual oil. This study focuses on the production of biodiesel from the blend of coconut and sunflower oil, two widely available plant-based oils with distinct fatty acid profiles. Coconut oil, rich in medium-chain saturated fatty acids, and sunflower oil, high in polyunsaturated fatty acids, offer complementary properties that enhance biodiesel quality. The homogeneous transesterification reaction is incorporated to convert these oils into fatty acid methyl esters (FAME), the primary components of biodiesel. The process parameters are kept at 1wt% (KOH)catalyst loading; 6:1 (methanol;oil); 60°C for 1 hour at around 500 rpm. The resulted biodiesel is analyzed using FTIR, NMR (1H and 13C) and GCMS for the validation of the Sunflower-Coconut biodiesel (SC BD). FTIR peaks at 1198 cm-1, 1016 cm-1and 880 cm-1 attribute to the methyl ester peaks. 3.67 ppm and 51.3 ppm in 1H and 13C NMR analysis respectively suggest the conversion of fatty acids to FAME. GCMS result shows the presence of different fatty acid methyl esters w.r.t retention time which confirms the successful production of biodiesel. Various physicochemical properties have also been evaluated using various standard methods and the results are Viscosity is 4.99 mm2/s; Flash point and Fire point are found to be 145 °C and 155 °C; Cetane number of the SC BD is 80 and the GCV determined is 43.374 MJ/kg all are well within ASTM standards. The engine performance and emission characteristics could give us a better idea about the quality of oil. The combination of the above edible oils can be taken into consideration for heterogeneous based transesterification using different biomass sources which can be a better sustainable approach. Keywords: Homogeneous; Transesterification; FAME; SC BD; FTIR; NMR; GCMS; ASTM