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Environmental chemistry 2019: A new green approach in the synthesis of biomass waste derived catalyst for biodiesel production - Safia S. Memon - University of Sindh

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Abstract

The level of development of the energy sector plays an important role in other sectors as well as on the national economy in general. The energy sector must be sustainable and must be based on the use of energy-efficient technologies. Energy efficiency in sources of biodiesel production from waste biomass is one of the tasks of the energy strategy in the Asian Countries. This article offers an innovative solution for increasing energy efficiency by using an environmentally friendly bio-waste for biodiesel. The proposed technology focuses on the production of biodiesel by using low cost and green catalyst. Here we demonstrate that hydrothermal carbon derived from waste biomass could be functionalized with sulfonic acid (-SO3H) to effectively catalyze the esterification of oleic acid to usable biofuels. Bio-wastes were converted to hard carbon, and then functionalized with catalytically active -SO3H groups on the surface through an environmentally benign process that involved the sequential treatment with L-cysteine, thiourea, and H2O2. The bio-waste derived hydrothermal carbon catalyst was characterized by using FTIR, elemental analysis, XRD, SEM, and pore volume is measured using BET surface area analyzer. The FT-IR technique was used to monitor the esterification of oleic acid with methanol and the maximum conversion yield was found to be 96% after 2 hrs. at 65 C by using 0.05 g of prepared catalyst as a heterogeneous catalyst. The same bio-waste derived hydrothermal carbon material treated with concentrated sulfuric acid at 150 ºC, similar catalytic activity was observed. Both catalysts could also effectively convert oleic acid or a mixture of fatty acids to usable biofuels at 65 ºC without leaching of the catalytic sites.

Biomass: Biomass is the material gotten from plants that utilization daylight to develop which incorporate plant and creature material, for example, wood from woodlands, material left over from rural and ranger service procedures, and natural mechanical, human and creature squanders. Biomass originates from an assortment of sources which include:

- Wood from common timberlands and forests
- Forestry ranches
- Forestry buildups
- Agricultural buildups, for example, straw, stover, stick rubbish and green horticultural squanders
- Agro-mechanical squanders, for example, sugarcane bagasse and rice husk
- Animal squanders
- Industrial squanders, for example, dark alcohol from paper fabricating
- Sewage
- Municipal strong squanders (MSW)
- Food handling squanders

The vitality contained in biomass initially originated from the sun. Through photosynthesis carbon dioxide noticeable all around is changed into other carbon containing particles (for example sugars, starches and cellulose) in plants. The substance vitality that is put away in plants and (creatures eat plants or different creatures) or in their waste is called bio-vitality.

At the point when biomass is singed it discharges its vitality, for the most part as warmth. The biomass carbon responds with oxygen noticeable all around to frame carbon dioxide. On the off chance that completely combusted the measure of carbon dioxide delivered is equivalent to the sum which was retained from the air while the plant was developing.

In nature, if biomass is left lying around on the ground it will separate over a significant stretch of time, discharging carbon dioxide and its store of vitality gradually. By consuming biomass its store of vitality is discharged rapidly and regularly in a valuable manner. So changing over biomass into valuable vitality copies the normal procedures yet at a quicker rate.

Biodiesel Production:

Biodiesel is an elective fuel for diesel motors that is created by artificially responding a vegetable oil or creature fat with a liquor, for example, methanol or ethanol. In words, the response is:

Oil + liquor → biodiesel + glycerin

The photograph shows a container of biodiesel and glycerin (likewise called glycerol). The biodiesel is the lighter-shaded

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layer at the top. The darker-hued rough glycerin has settled to the base.

It is imperative to understand that unmodified vegetable oil, once in a while called straight vegetable oil (SVO) or waste vegetable oil (WVO), isn't biodiesel. A few people have utilized SVO or WVO in diesel motors with changing degrees of achievement. The essential issue is the high consistency and low instability of the unmodified vegetable oils. No matter what, U.S. motor producers have suggested against the utilization of SVO and WVO. More conversation of SVO and WVO can be found here.
Biodiesel is typically favored over SVO and WVO in light of the fact that the synthetic response changes over the oil or fat into intensifies that are nearer to the hydrocarbons found in normal diesel fuel.

The synthetic response that changes over a vegetable oil or creature fat to biodiesel is designated "transesterification." This is a long name for a basic procedure of joining a substance compound called an "ester" and a liquor to make another ester and liquor. Oils and fats are remembered for the ester family. At the point when they respond with methanol or ethanol, they make methyl or ethyl esters and another liquor called glycerol or, all the more usually, glycerin.

The vegetable oils and creature fats used to make biodiesel can emerge out of essentially any source. These items comprise of synthetic substances called triglycerides, so biodiesel can be produced using soybean oil, canola oil, hamburger fat, and pork grease, and even from such intriguing oils as pecan oil or avocado oil.

Indeed, even utilized cooking oil or waste oil can be utilized to make biodiesel. Notwithstanding, these oils present uncommon difficulties for biodiesel creation since they contain contaminants, for example, water, meat scraps, and breading that must be sifted through before the oil is changed over to biodiesel.

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