INNOVATIVE BIOFUEL PRODUCTION FROM HYDROTHERMAL LIQUEFACTION TECHNOLOGY BY BLENDING POLYVINYL ALCOHOL (PVA) AND LIGNOCELLULOSIC BIOMASS (SAWDUST)

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Abstract: Biofuels have become a promising solution for solving the energy security, environmental, and economic challenges associated with petroleum dependency. The global biofuels industry is now on the verge of entering a new phase of development focused on advanced and drop-in biofuels. Biofuels for road transportation will grow from 32.4 billion gallons in 2013 to 51.1 billion by 2022. Biomass is abundant in nature so it can be used to produce renewable electricity, thermal energy, or transportation fuels (biofuels). Biomass is defined as living or recently dead organisms and any by-products of those organisms, plant or animal. Biomass encompasses all living things. The use of polyvinyl alcohol (PVA) particularly in commercial industry has arisen worldwide. This is due to their unique chemical and physical properties, as well as being nontoxic, highly crystalline, and water-soluble polymer and having good film-forming and high hydrophilic properties and donating nature of hydrocarbons. The main objective of this study is the extraction of crude oil by hydrothermal liquefaction of PVA and lignocellulosic biomass. The hydrothermal liquefaction (HTL) involves direct liquefaction of biomass, with the presence of water and polyvinyl alcohol and some catalysts, to directly convert biomass into liquid oil, with a reacting temperature of lower than 400 °C. First the biomass (sawdust) is pre-treated under 120 degree Celsius and 1 atm pressure and then obtained liquid is condensed to obtained light oil biofuel. Water plays an essential role in HTL Biomass is mixed with the PVA and HTL is performed. Characterization and analysis of the crude such as flash point, fire point density, calorycal value and the acid value test. The obtained cellulose crystals, biomass were used as a application in forming bio composite film with varying the concentration of biomass and water soluble PVA. Characterization and analysis of the bio composite film such as scanning electron microscope (SEM), soil degradability test, water uptake test was carried out.

Keywords: liquefaction; biofuels; hydrothermal liquefaction (HTL), crude oil.

Objectives:
- Extraction of Cellulose crystals (CC) from saw dust by acid hydrolysis.
- Development of biofuel by adding PVA.
- Extraction of crude oil by hydrothermal liquefaction of PVA and lignocellulosic biomass.
- Characterization of crude oil & comparison of characteristics with present fuels.
- Establishment of hydrothermal liquefaction technology in large scale.
- Preparation of Cellulose bio composites with organic polymers like Poly vinyl Alcohol (PVA).

Methodology:
- Converting biomass from its natural solid form to liquid fuels (i.e) converts biomass to crude oil and gas (biomass such as coconut husk, corn stalk, garbage).
- Treatment of biomass at high pressures of 50–200 atm and high temperatures of 250–400 °C
- The crude oil obtained must be separated by using solvent extraction, distillation etc.
- Comparison of physical and chemical properties from bio-crudes obtained.
- Physical properties of bio-crude will be compared with diesel or biodiesel standards.
- Chemical properties, such as viscosity, density, heating value, hydrogen-carbon (H/C) and oxygen carbon (O/C) ratios.
- The chemical composition of bio-crudes is determined through gas chromatography-mass spectrometry (GC-MS), nuclear magnetic resonance (NMR) spectroscopy and Fourier transform ion cyclotron resonance-mass spectrometry (FTICR-MS) to perform analyses with higher resolution and accuracy.

Analysis of the crude oil obtained.
- Cetane Number (CN)-A high CN signifies good ignition quality, good cold start properties, minimal white smoke in exhaust and low UHC and CO emissions.
- Vapour Pressure - vapour pressure affects performance of fuels, especially during cold start conditions.
- Oxidation Stability - Oxidation stability describes the resistance to oxidation of fuel during storage.

Outcome and results:
- Utilization of biomass (sawdust) for innovative biofuel production.
- Bitumen development and innovative crude biofuel.
- To develop an economical and environment friendly process for production of biofuel.
• To develop abundant biomass as a source of biofuel.