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Conference Conversions of Waste High-Density Polyethylene Plastic into Green Fuel using Zno and Tio_2 Catalysts via a Pyrolysis

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Abstract

The current studies had a definite aim of the analyzing and bring farther the catalytic conversion of waste and standard plastic into liquid hydrocarbons fuel and the experiments were successfully carried out during the research. Waste high-density polyethylene plastics convert into green fuel in presence of different metal oxides catalysts in different weight present like ZnO, TiO_2. A number of industries methods have return up supported these results. However, there are several issues that have return up to be resolved within the near future. Presentchallenges consist, requirement for production, minimization of waste handling cost, cost of production and optimization of gasoline/diesel range fractions for a wide range of waste plastics. One of the ways to minimize the cost of the process is more efficient metal oxides catalysts for the pyrolysis process which would be cheaper. Green fuel was extremely inflammable and high ignitable capability.

Catalytic conversions of waste high-density polyethylene plastics into green fuel/petrochemicals were carried out using a zinc oxide (ZnO) catalyst by a pyrolysis-catalytic cracking process. Green fuel can be used as the different purpose of energy-source like petrol/diesel engines. Green fuel were characterized by 2D-GC×GC/TOFMS, FT-IR spectroscopy, ICP, ^1H NMR spectroscopy, CHNS/O analyzer and its results found absolutely good hydrocarbon compounds as (petrochemicals obtained from waste high-density polyethylene). Conversion rates of four experiments as waste high-density polyethylene into green fuel was found 79%, 82%, 84%, 91
%, light gases 20.50%, 17.55%, 15.65%, 8.59%, residues 0.50%, 0.49%, 0.35%, 0.41

During experiments process was analyzed that high-density polyethylene plastics degradation oftemperature by TGA was very high near about 500 to 550 ºC but plastics degradation with metaloxides catalysts by pyrolysis process was very low temperature found 350 ºC to 410 ºC. Collected green fuel from waste high-density polyethylene plastics analyzed by various testmethods of petrol/diesel and they were found that equal to petrol and diesel. One also to checkneed the efficiency of green fuel from plastics in petrol/diesel engine than regular petrol/diesel asit was found that plastic fuel equal to regular petrol/diesel. Petrol engine was run from 50 mlpetrol to 3.3 km and Petrol engine was run from green from plastics 50 ml to 3.3 km.

The catalysts have done excellent work with during the pyrolysis of plastics. Properties ofcatalyst shown in subsequent points:-

1. Petrol/diesel fractions produced by pyrolysis-catalytic cracking were excellent quality.
2. Catalytic cracking was easily controlled.
3. Catalytic-pyrolysis of plastics was not requiring high temperature.
4. The yield of petrol/diesel was higher because of the formation of branched-chain isoparaffins, n-paraffins, olefins, cyclic paraffins, aromatics (mono, di and poly-aromatics) and other hydrocarbons.

Hydrocarbons fractions contain a very little amount of sulfur because of less sulfur compound available in raw plastic materials

Keywords: - Waste high-density polyethylene, green Fuel, Pyrolysis process, ZnO and TiO_2 Catalysts