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WASTE COOKING OIL TRANSESTERIFICATION WITH LITHIUM AND TIN OXIDES SUPPORTED ON MAYENITE

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Vegetable oil production is increasing year by year resulting in an increase of waste cooking oil, which is an attractive feedstock that holds challenges for biodiesel production. Biodiesel production reduces the dependency on fossil fuels and helps to meet the energy demands for the future. Homogeneous transesterification processes are commonly carried out to produce biodiesel but due to its high waste to product mass ratio, the heterogeneous transesterification clearly has a recyclability advantage on catalyst reusability, product separation, process waste reduction, and low valuable sources usage, i.e. water and catalyst. Even though heterogeneous catalysis has been proven effective in waste cooking oil transesterification, still exist challenging process conditions that can be improved for the biodiesel process and throughput. In this study solid oxide catalysts were synthesized to address yield and selectivity. Mayenite was used as the support for lithium and tin oxides. The proper distribution of Li2O and SnO2 will lead to a solid reusable catalyst. Mayenite was synthesized from Ca(OH)2 and Al2(NO3)3 9H2O. The salts of tin and lithium were impregnated on mayenite previous to calcination for their respective oxide formation. Three catalysts were chosen for this study, the oxides content was designed to have different mass ratios within mayenite. The catalysts active phases were impregnated over mayenite in mass ratios that ranged 5/45, 10/40 and 15/35 (Li2O wt.%/SnO2 wt.%). The catalysts were tested and the catalyst that showed higher conversions was then used to optimize the different reaction conditions, i.e. temperature, methanol to oil molar ratio, and catalyst concentration in the reactor (wt. % relative to oil mass). Despite the high content of free fatty acids in the waste cooking oil the conversion to biodiesel is considerable. Improving the Li2O/SnO2 mass ratios and the reusability of the catalyst are recommended.

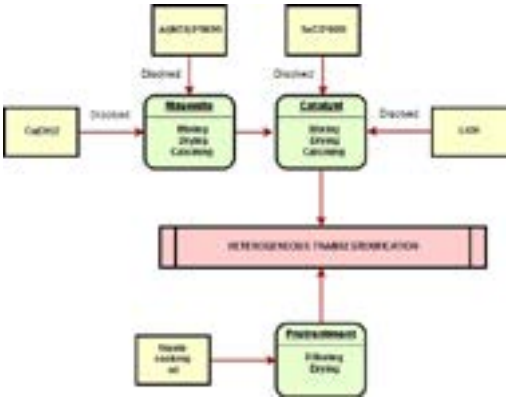

Figure 1: Catalyst synthesis and waste cooking oil pretreatment

Biography

Jerry Solis holds a BSc in Chemical Engineering from UMSS (Universidad Mayor de San Simon, Cochabamba - Bolivia). Currently, he is a PhD candidate at KTH (Royal Institute of Technology, Stockholm - Sweden). He has been working in the development of liquid biofuel production processes since 2014. The flexibility of his work allows to produce biofuels form edible oils, to non-edible oils and even cellulosic ethanol. He has expertise in the synthesis and characterization of novel catalysts for the heterogeneous transesterification. His project involves the usage of bioconversion processes to reduce the greenhouse gas emissions not only by the use of cleaner production methods but also focusing in second generation feedstock. He also has experience in the enzyme production by extremophilic bacteria isolated in extreme areas of Bolivia. His experience in microorganism studies facilitates the vision to produce ethanol from cellulosic raw materials.

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