Study of crustacean and bivalve residue as catalyst in the synthesis of biodiesel

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Abstract (300 word limit)

Biofuels are renewable fuels and the main alternative for fossil fuels. Biodiesel consists of alkyl esters and is mainly obtained by the transesterification of a triglyceride with an alcohol in the presence of a homogeneous or heterogeneous catalyst. Heterogeneous catalysts, especially CaO, are widely used since they can be reused and synthesized from renewable sources. The objective of this work is to process and characterize fishery residue, evaluating the use of these as sources of CaO to be used as a heterogeneous catalyst in the production of biodiesel from soybean oil and methanol. Crustaceans and bivalve carapaces were dried, crushed, sieved and calcined at 900 ° C for 3 h. Both products obtained before and after the calcination were characterized by FTIR, XRD, SEM and TGA/DTGA. The calcined product was used as catalyst (5% w/w) in biodiesel synthesis during reflux of soybean oil with methanol in the 1/17 molar ratio of oil/methanol. The kinetic of the reaction was determined by Nuclear Magnetic Resonance of Proton (^{1}H NMR). The yield of the 4 catalysts was about 50% during the calcination process. The TGA/DTGA showed the elimination of water molecules and the decomposition of $CaCO_3$ in CaO. The XRD confirmed the composition of different crystalline forms of $CaCO_3$ to each different shell before calcination but the same crystalline structure for all of them after calcination. The FTIR confirm the $CaCO_3$ decomposition in CaO after calcination. It can be observed by ^{1}H NMR that all the catalyst presented efficient activity as a catalyst in the formation of the biodiesel production using soybean oil and methanol with a slight difference at the Kinect behavior.

Image

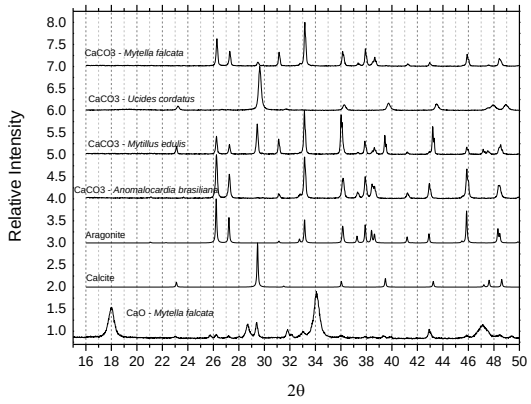


Figure 1: DRX of the catalysts before and after the calcination

Recent Publications (minimum 5)

1. Prado RG, Almeida GD., Oliveira AR, Souza, PMTG, Cardoso CC, Constantino VRI, Pinto FG, Tronto J, Pasa, VMD (2016) Ethanolysis and Methanolysis of Soybean and Macauba Oils Catalyzed by Mixed Oxide Ca-Al from Hydrocalumite for Biodiesel Production. Energy & Fuels (Online) 30:6662-6670.
2. DE Sousa FP, Dos Reis GP, Cardoso CC, Mussel WN, Pasa VMD (2016) Performance of CaO from different sources as a catalyst precursor in soybean oil transesterification: kinetics and leaching evaluation. Journal of Environmental Chemical Engineering 4:1970-1977.
3. Souza FP, Cardoso CC, Pasa VMD (2016) Producing hydrocarbons for green diesel and jet fuel formulation from palm kernel fat over Pd/C. Fuel Processing Technology 143:35-42.
4. SILVA LN, CARDOSO CC, Pasa VMD (2016) Production of Cold-Flow Quality Biodiesel from High-Acidity On-Edible Oils-Esterification and Transesterification of Macauba (Acrocomia aculeata) Oil Using Various Alcohols. BioEnergy Research 9:864-873.
5. SILVA LN, Pasa VMD, CARDOSO CC (2016) Synthesis and characterization of esters from different alcohols using Macauba almond oil to substitute diesel oil and jet fuel. Fuel (Guildford) 166:453-460.



Biography (150 word limit)

Claudia Cardoso is currently an Associate Professor at the Federal Rural University of Pernambuco (UFRPE / Brazil). Her expertise in synthesis of biodiesel and biojet fuel using homogeneous and heterogeneous catalyst. In this area she developed reactions with refined and residual oils, as well as producing heterogeneous catalysts from various sources, including crustacean waste. Claudia holds a Bachelor's degree in Chemistry (1997), a Masters in Chemistry (2000), a Ph.D. in Chemistry from the Federal University of Pernambuco (2006) and a postdoctoral degree at UFMG on biojet fuel. She also worked as a researcher at Novartis (Horsham / England) in the field of organic synthesis (2000). During all this years and different activities areas she got experience in the field of chemistry, with emphasis on organic synthesis, inorganic synthesis and spectroscopic characterization.

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Notes/Comments: