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Biodiesel production from *Acrocomiaaculeata* acid oil by (enzyme/enzyme) hydroesterification process: Use of vegetable lipase and fermented solid as low-cost biocatalysts

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Thisstudyinvestigated a new process of enzyme/enzyme hydroesterification for biodieselproduction using a low-cost acid oil (10.5 wt.% acidity) from macauba (*Acrocomiaaculeata*) pulp asraw material. The ethyl esters were produced by the hydrolysis of the oil using vegetableenzyme (VE) obtained from dormant castor seeds followed by esterification of the released free fattyacids (FFAs) with ethanol catalyzed by fermented and dry babassu cake with lipase activity from *Rhizomucormiehei*. The vegetable enzyme-catalyzed hydrolysis produced 99.6% of FFAs after 6 h in a mediumwith high oil concentration (50% v/v) and without organic solvent and emulsifier. For the esterificationreaction, the best result was attained with an ethanol:FFA molar ratio of 2:1 and 15.1 U of dry fermentedsolid per g of FFAs at 40°C, which yielded 91% of conversion after 8 h in a solvent-free system. Similar esterification conversions were obtained with the commerciallipases Novozym 435 and Lipozyme RM IM and the fermented solid. The fermented solid was reusedin successive 6-h batches for esterification reactions and conversions of over 60% were maintained foreight cycles. After two consecutive esterification reactions the resulting biodiesel met important Brazilianstandards such as: density, viscosity kinematic, flash point, carbonresidue, free glycerol and total glycerol, monoglycerides and triglycerides. The ester content was of 96.7% (esters of fatty acids of 8–18 carbons). This new approach is an alternative method to lower enzyme costs and consequently make the biodiesel obtained by enzymatic route more cost competitive.

Biography

Erika Cristina G. Aguieiras is from Rio de Janeiro, Brazil. She graduated in Biologist in 2008 from the State University of Rio de Janeiro (UERJ). In 2011, she finished her M.Sc. studies at Schooo of Chemistry, Federal University of Rio de Janeiro (UFRJ). Currently she is a PhD student in Chemistry Institute, Department of Biochemistry, UFRJ. Her research includes lipase production by solid state fermentation and enzymatic catalysis to biodiesel synthesis.

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