

Title: BIODIESEL PRODUCTION FROM EDIBLE OIL WASTEWATER SLUDGE WITH BIOETHANOL USING NANO-MAGNETIC CATALYSIS

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Currently, most sludge from the wastewater treatment plants of edible oil factories is disposed to landfills, but landfill sites are finite and potential sources of environmental pollution. Production of biodiesel from wastewater sludge can contribute to energy production and waste minimization. However, conventional biodiesel production is energy and waste intensive. Generally, biodiesel is produced from the transesterification reaction of oils with alcohol (i.e. Methanol, ethanol) in the presence of a catalyst (Morales *et al.*, 2014). Homogeneously catalysed transesterification is the conventional approach for large scale production of biodiesel as reaction times are relatively short. Nevertheless, homogenous catalysis presents several challenges such as high probability of soap formation in the presence of water and free fatty acids and difficulty of separation and reusability (Kiss and Boskovic, 2012). The current study aimed to reuse wastewater sludge from the edible oil industry as a novel feedstock for both monounsaturated fats and bioethanol for the production of biodiesel. Preliminary results have shown that the fatty acid profile of the oilseed wastewater sludge is favourable for biodiesel production with 48% (w/w) monounsaturated fats and that the residue left after the extraction of fats from the sludge contains sufficient fermentable sugars after steam explosion followed by an enzymatic hydrolysis for the successful production of bioethanol [29% (w/w)] using a commercial strain of *Saccharomyces cerevisiae.* A novel nano-magnetic catalyst was synthesised from mineral processing alkaline tailings, mainly containing dolomite originating from cupriferous ores using a modified sol-gel technique (Shengyang *et al.*, 2011). Both the catalytic properties and reusability of the catalyst were investigated. A maximum biodiesel yield of 64% was obtained, which dropped to 52% after the fourth transesterification reaction cycle. The proposed approach has the potential to reduce material costs, energy consumption and water usage associated

with conventional biodiesel production technologies. It may also mitigate the impact of conventional biodiesel production on food and land security, while simultaneously reducing waste (Kumar *et al.*, 2015).

Biography

Wighens Ngoie is currently doing his PhD at the Cape Peninsula University of Technology within the Biocatalysis and Technical Biology Research Group. He started his chemical engineering studies since Technical high-school in Democratic Republic of Congo at Institut Technique Mutoshi and moved to the University of Lubumbashi to complete his BSc Eng. degree in Chemical Engineering and precisely in the area of hydrometallurgy processes for copper recovery, while in the meantime working as a plant and process operator in one of the biggest mining company in the Democratic Republic of Congo (Gecamines). Afterwards Wighens Ngoie relocated to South Africa to pursue with his studies and registered at the Cape Peninsula University of Technology in Cape Town, for his Master's degree in Chemical Engineering involving Nanotechnology applied for Wastewater treatments, meanwhile working as a part-time lecturer. His thesis is about the Biodiesel production from Edible oil waste sludge using Nano-magnetic where He has been involved and collaborated with Dr Marilize LeRoes-Hills, Dr Pamela Welz, Dr Arthur Mpela and Dr Seun Oyekola in several projects such as: Wastewater treatments, wnsecticides manufacturing, mineral processing and biofuels production.

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Category: (Oral presentation/ Poster presentation)