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## Trans-esterification of locally used cooking oil over zirconia/titania nano-catalyst

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During the last twenty years, scientists have been looking towards to find a possible alternative for fossil fuel to fulfill the energy demand of the world as the crude oils are depleting day by day. Biodiesel is one of the best possible resources that have come to the fore-front because of its availability, renewability, better gas emissions, non-toxicity, and its biodegradability. However, the feedstock prices and biodiesel production costs are the main problems faces biodiesel industry to commercialize the fuel because the cost of biodiesel fuel produced from virgin vegetable oils is 1.5 times costlier than its fossil-based counterpart. These issues can be addressed by using cheap feedstock such as used cooking oil with replacing the conventional catalysts with catalysts highly tolerant to moisture and free fatty acids because free fatty acids and moisture contents in cheap raw materials have adverse on the activity of the catalysts. The present work is focused on the novel commercial zirconia/titania nano-catalyst for the trans-esterification of locally sourced used cooking oil which contains high concentration of free fatty acids and moisture. Fourier Transform infrared spectroscopy, X-ray diffraction, scanning electron microscopy, Transmission electron microscopy, X-ray photoelectron spectroscopy, Thermo-gravimetric analysis, and $N_2$ adsorption-desorption isotherms have been used to determine the chemical structure, morphology, surface area, thermal/oxidative stability and particle sizes for the zirconia/titania nano-catalyst. The effect of catalyst concentration, reaction temperature, time of trans-esterification, and methanol to oil ratio on the biodiesel yield was investigated. It was found that under certain process parameters a yield of 100% can be achieved using zirconia/titania as a catalyst. Furthermore, the synthesized biodiesel from the catalytic trans-esterification processes was analyzed in accordance to ASTM D6475 and EN14214 standard methods to determine the characteristic fuel properties such as kinematic viscosity, density, flash point, FAME content, LAME content, and acid number.

### Biography

Jabbar Gardy received his BSc degree in Chemistry from University of Salahaddin, Erbil-Iraq in 2003 and MSc in Oil and Gas Technology from Burgas Professor Dr Assen Zlatarov University, Burgas-Bulgaria in 2008. During 2003-2006, he worked as a Lab Instructor at the Department of Chemistry of the College of Science from University of Salahaddin, Erbil-Iraq. He has been delivering Undergraduate lectures from 2009 to 2012 at the University of Salahaddin-Erbil. He got a scholarship from the Kurdistan Regional Government on the Humanity Capacity Development Programme to study PhD. He is currently in his final year of a PhD under the supervisions of Dr Ali Hassanpour and Dr Xiaojun Lai in the Institute of Particle Science and Engineering at the University of Leeds, UK.

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