CRUDE GLYCEROL TO VALUABLE CHEMICAL PRODUCT- A RELIABLE INDUSTRY PROCESS

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PRODUCT BACKGROUND

Current Issues

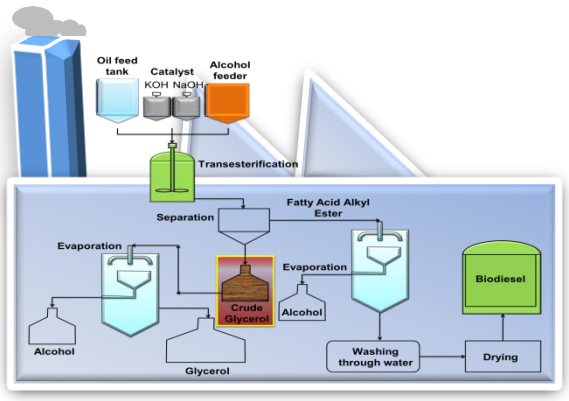
- Market of organic carbonates chemical is dominated by petroleum-based products.
- Under-utilized crude glycerol for the production of valuable high end products.
- Inability to directly utilised crude glycerol hinders the growth of existing technology.

Solutions

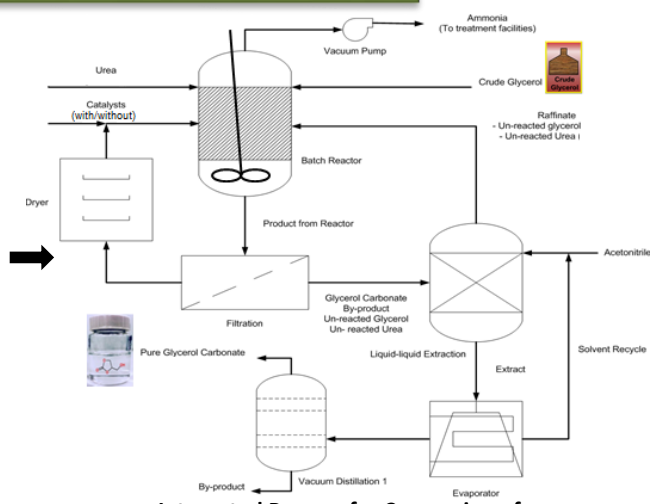
- Glycerol carbonate co-produced with biodiesel as renewable resource to substitute petroleum-based carbonate chemicals.
- Direct and single step process in converting crude glycerol to glycerol carbonate.

METHODS

Integrated Biodiesel-Glycerol Carbonate Production



Biodiesel Processing Plant



Integrated Process for Conversion of Crude Glycerol to Glycerol Carbonate

PATENT

PATENT FILED: PI 2013702147

PUBLICATION

Viable Glycerol Carbonate Synthesis through Direct Crude Glycerol Utilization from Biodiesel Industry, Waste and Biomass Valorization (2017): 8, 1049-1059

BENEFITS/USEFULLNESS

- Potentially supplement and replace petroleum-based organic carbonate chemicals.
- Conversion of crude glycerol to value-added commodity
- To help make biodiesel production more economical

NOVELTY

- Direct utilisation of crude glycerol without any treatment
- Co-production of valuable cyclic carbonate chemical with commercial biodiesel plant
- Cheap and abundantly available co-reactant
- Potential recapture and reuse the release gas for close loops process

ENVIRONMENTAL IMPACT

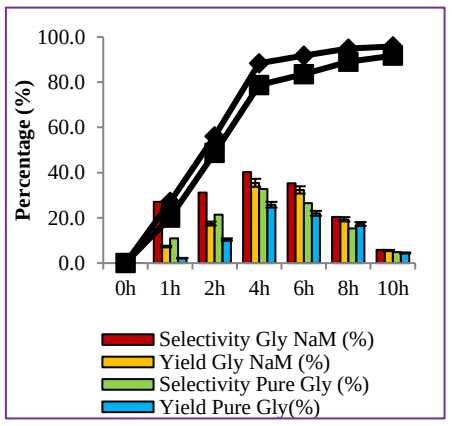
- Green technology approach (Direct utilization of industrial waste as feedstock).
- Intrinsically safe process and product
- Avoiding and minimizing the use of hazardous solvent.
- Near zero waste process due to high yield of target product and potential recapture and reuse the release CO_2 gas.
- Reduce dependency on non-renewable petroleum-based carbonate chemicals produced from toxic and hazardous materials.

MARKETABILITY

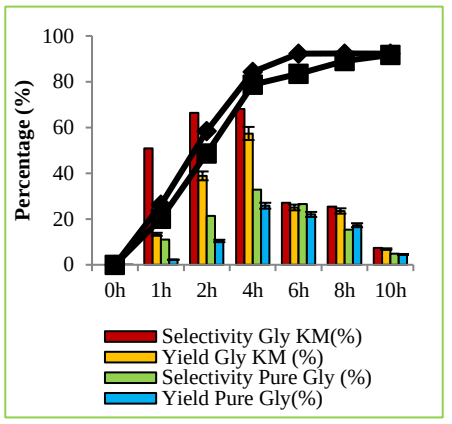
- Malaysia biodiesel production capacity of 2.5 billion liters in 2017, thus 0.25 billion liters (280K tonnes) of crude glycerol as side product potentially produce.
- Industry feasible and reliable process with minimum Capex and Opex investment
- Current Selling Price: RM ~0.75 per kg of Crude Glycerol
- Current Selling Price: RM ~15.04 per kg of Glycerol Carbonate
- Estimated Production Cost: RM 8.00 per kg of Glycerol Carbonate

PRODUCTION EFFICIENCY

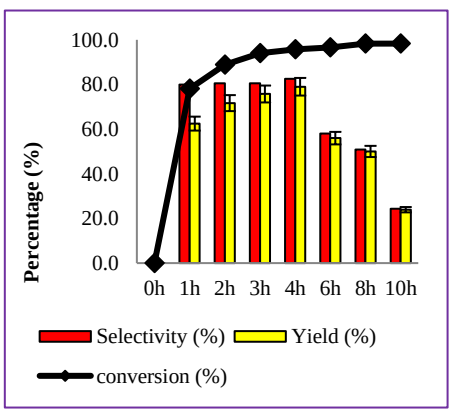
Glycerol Sodium Methylate (Gly NaM)



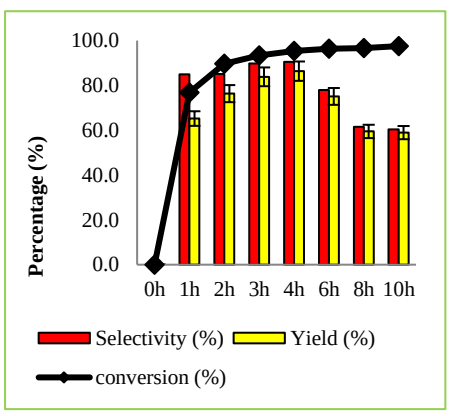
Glycerol Potassium Methylate (Gly KM)



Glycerol Mimicked with 1.6 wt % of Sodium Methylate



Glycerol Mimicked with 1.6 wt % of Potassium Methylate



PRODUCT CHARACTERISTICS

Organic Carbonate	Boiling Point/ K	Density$^{(293\ K)}$/ g.cm^{-3}	Viscosity$^{(298\ K)}$/ Pa.s	Biodegrability / day^{-1}	Oxygen content
Glycerol carbonate (GC)	410	1.40	6.10×10^{-2}	Readily	54.2%
Dimethyl carbonate (DMC)	363	1.07	5.90×10^{-4}	88%	53.3%
Ethylene carbonate (EC)	516	1.34	2.56×10^{-3}	Readily	54.5%

INDUSTRY PARTNER

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AWARDS

Gold Medal, Creation, Innovation, Technology & Research Exposition, 2018, UMP