



BABEȘ - BOLYAI UNIVERSITY

**FACULTY OF CHEMISTRY AND CHEMICAL
ENGINEERING**



**Complete integration of glycerol in
biodiesel production process by making
acetals additives**

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Application field and thesis motivation

- **DRAMATIC GROWTH OF THE BIODIESEL INDUSTRY**



- **GLYCEROL AVAILABLE AT A LEVEL EXCEEDING DEMAND BY SEVERAL TIMES**

- Glycerol is yielded at about 10%(wt/wt) of biodiesel during the process of biodiesel production



- **VERY VOLATILE MARKET**

- Pricing strongly dependent on supply;
- Growing supply due to growing biodiesel demand;
- Global oversupply crisis



- **URGENT NEED TO FIND NEW APPLICATIONS**

- Necessary expansion in glycerol refining capacity is delayed;
- Especially need for new uses of glycerol



GLYCEROL BASED BIODIESEL ADDITIVES

Thesis objectives

- **Purification of raw glycerol from biodiesel industry**

- crude glycerol contains a large amount of contaminants (water, methanol, soap/free acids, salts, unused reactants)
- crude glycerol purification is necessary for value-added products synthesis

- **Valorisation of glycerol by condensation with formaldehyde**

- glycerol acetal improve cold flow properties, reduce particulate emission, fuel viscosity

Laboratory scale



- Borosilicate glass
- Visual observation
- Effect of reaction condition
- 1 l- Reaction volume of the reactor

Pilot

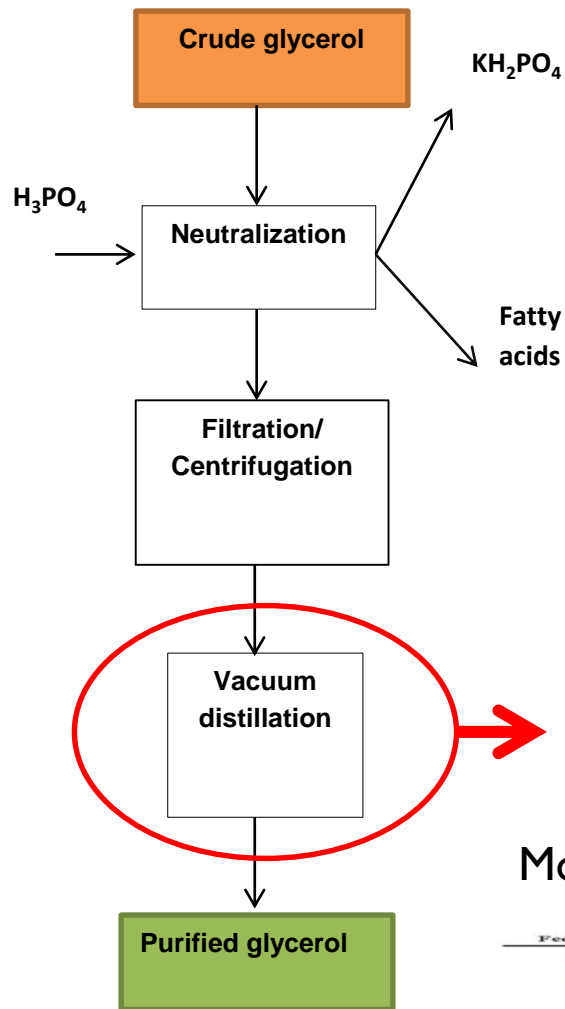


- Stainless steel
- 500 l Reaction volume of the reactor
- Molecular distillation



Industrial proposal

Purification of raw glycerol from biodiesel industry

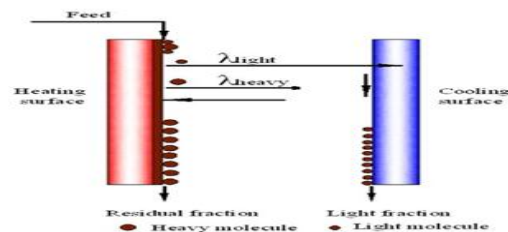


General stages in the glycerol purification process

Basic research



Molecular distillation



Molecular distillation principle

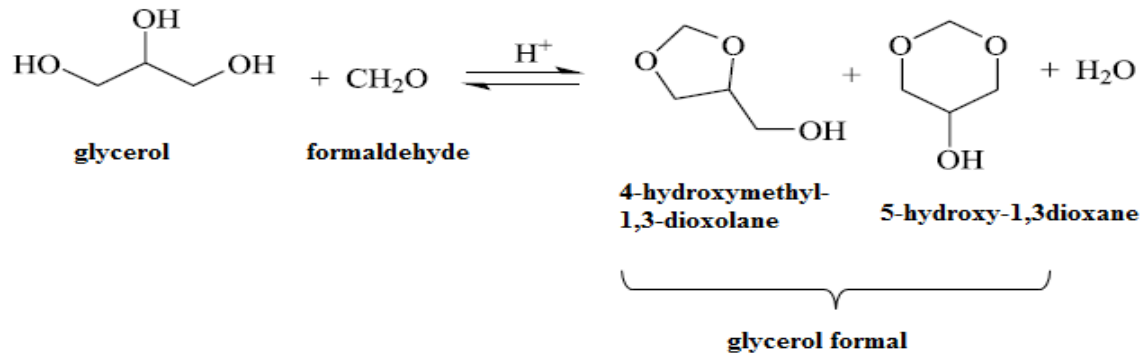


Molecular distillation laboratory column



Molecular distillation pilot scale column

Glycerol formal synthesis



General equation for glycerol formal synthesis in acid catalysis

**Objective's
general
approach**

Influence of different parameters in the reaction system:
Catalyst loading; Reactants; Temperature; Reaction time; Stirring speed



Laboratory scale



Pilot



**Industrial
proposal**