# Development of Heterogeneous Catalysts for Valorisation of $CO_2$ and Crude Glycerol

**"IfS: Integrated Process for Conversion of $CO_2$ into Value-added Product, and Simultaneous Production of Biodiesel without Waste Glycerol by-product".**


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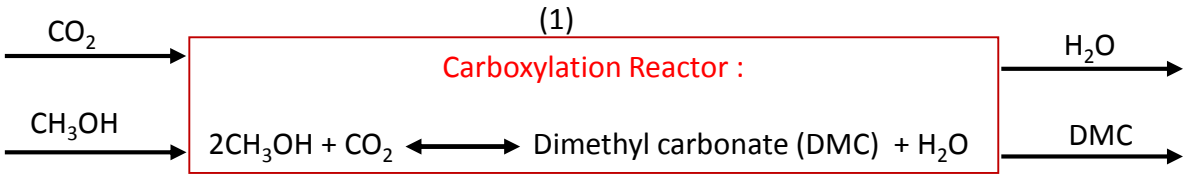
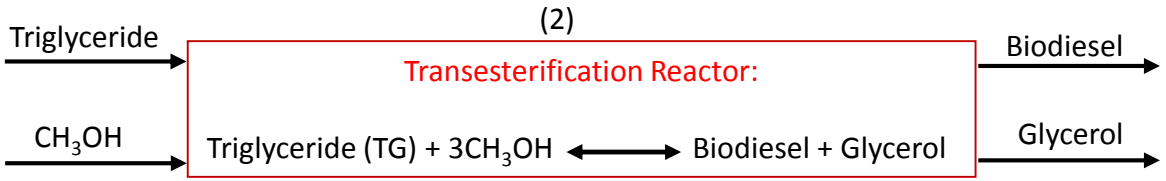
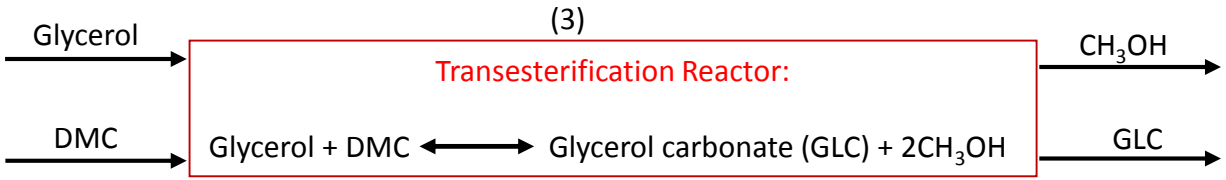
# Conversions of $CO_2$ & Glycerol into Organic Carbonates with Biodiesel Production

- **Carbon dioxide and crude glycerol are huge industrial waste streams**

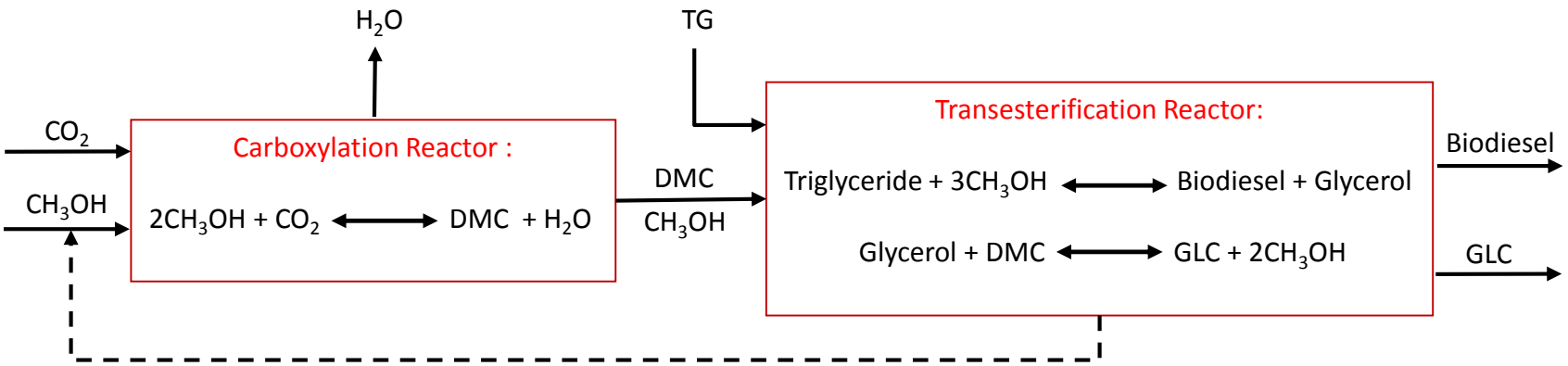
- **Valorisation of these waste streams will generate wealth, reduce global $CO_2$ emission and lead to reduction in the overall cost of biodiesel production.**

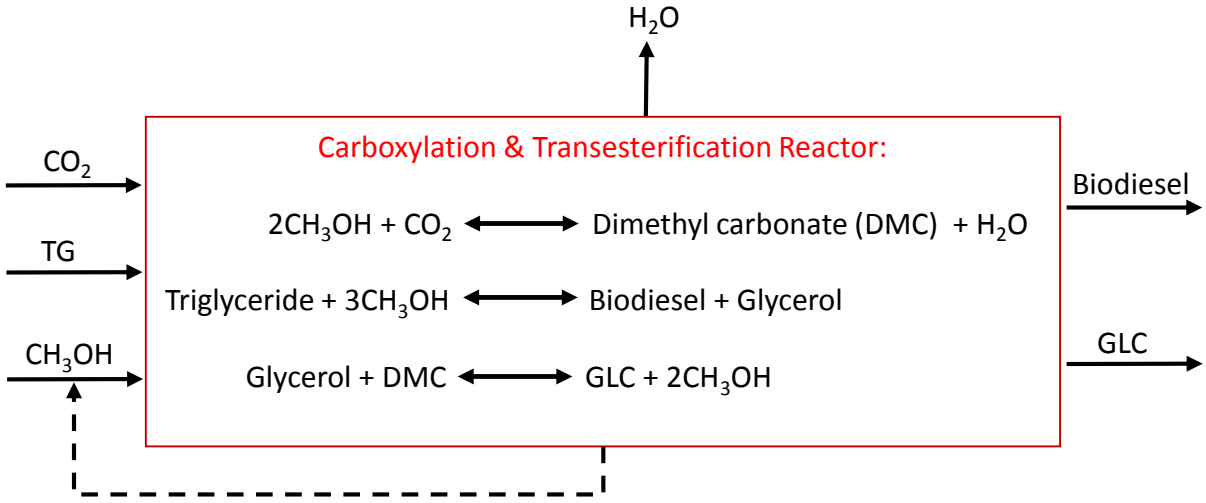


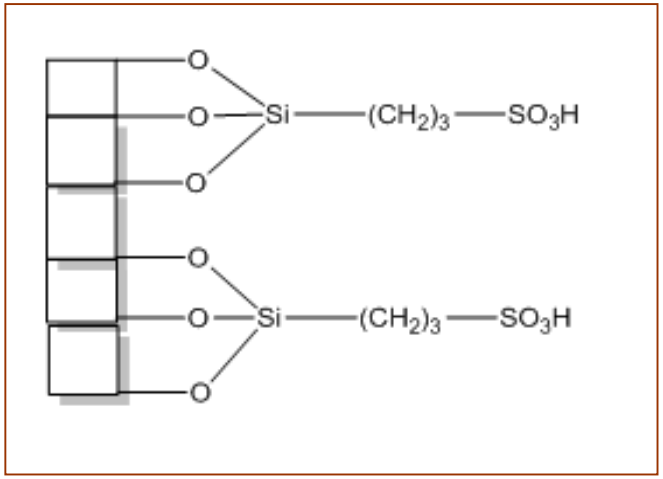



# Integrated Process for $CO_2$ & Glycerol Valorisation and Simultaneous Transesterifications

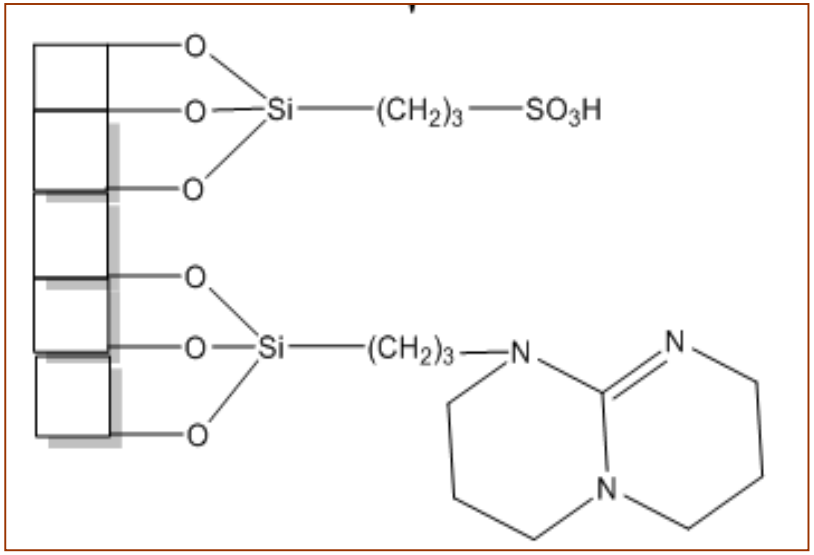


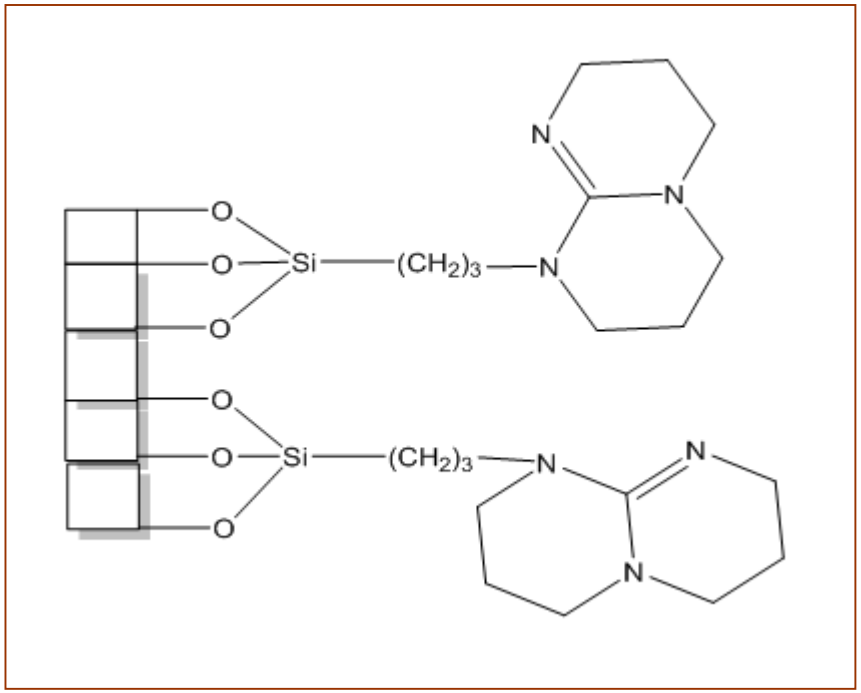



# Catalysis of Integrated $CO_2$ & Glycerol Valorisation with Biodiesel Productions




- Propyl sulphonic acid catalyst
- Propyl triazabicyclodecene catalyst
- Propyl sulphonic- triazabicyclodecene



# Conclusions

- The process will utilise two substantial industrial waste streams namely, $CO_2$ and waste crude glycerol.
- Valorisation of $CO_2$ and waste crude glycerol creates wealth from waste, and leads to reductions in global $CO_2$ emission.
- Productions of DMC and GLC would provide economic incentives to drive the global demand for reductions in $CO_2$ emissions.