Supplementary File:

Catalyst free production of partial glycerides: Acetone as co-solvent

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ABSTRACT

Glycerolysis of sunflower oil was studied using acetone as the solvent. Reactions were carried out at 200 to 250°C without the need of conventional catalyst. The use of acetone in glycerolysis of oil allowed the reaction to be carried out at 250°C and 1.8 MPa, resulting in a product that comprises 4.5% solketal, 5.8% FFA, 49.2% MG, 33.5% DG and 7% TG in 2 h. The important parameters investigated in this study were acetone addition, stirring and reactor loading.

This new approach in the synthesis of partial glycerides (monoglycerides and diglycerides) avoids the use of chemical catalyst, thus avoiding unnecessary wastewater production. The partial glycerides produced may be utilized in may areas of food and pharmaceutical industries. Moreover the use of acetone as solvent allows the process to be carried out at lower operating pressures compared to other non-catalytic glycerolysis and at the same time co-produces solketal, having a wide application in fuels, pharmaceuticals and chemical synthesis.

***Keywords*:** acetone, glycerolysis, partial glycerides, sub/supercritical solvent/ solketal

Supplementary Figures:

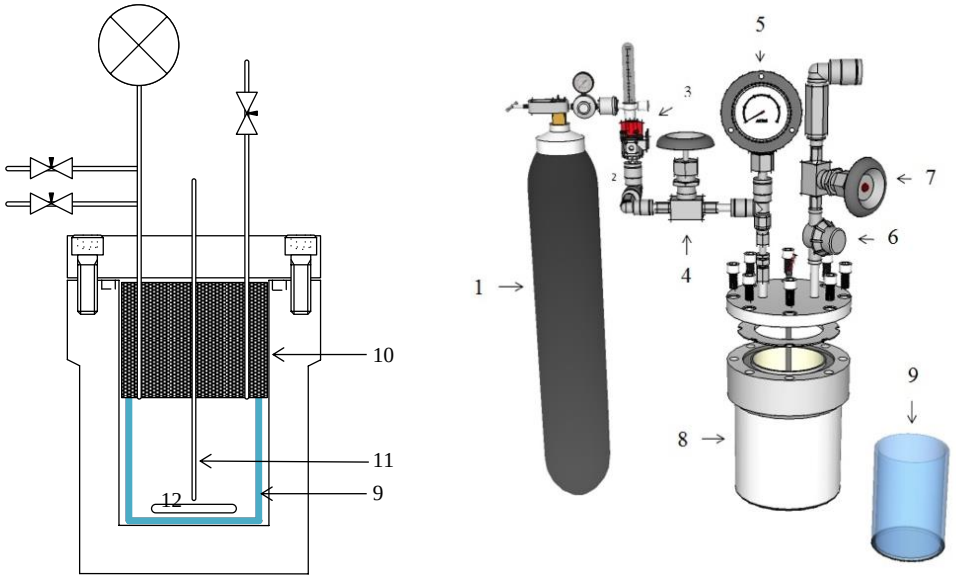

Figure S1. High Temperature Reactor (1. Nitrogen gas cylinder, 2. safety valve, 3. Check valve, 4. Inlet valve 5. Pressure gauge, 6. Filter, 7. Outlet valve, 8. Reactor, 9. Glass chamber, 10. Spacer, 11, Thermocouple (K-type), 12. Magnetic stir bar)

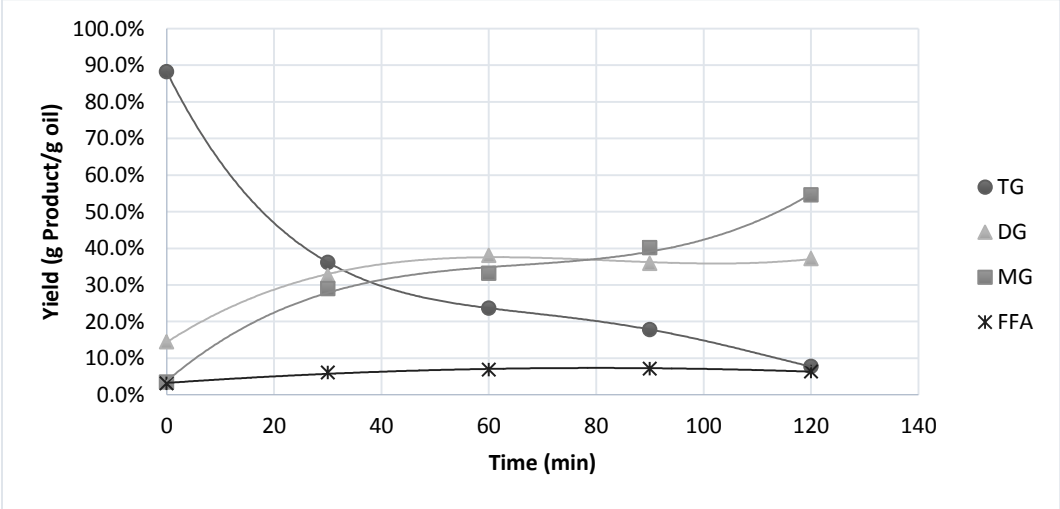

Figure S2. Time courses of glycerolysis of sunflower oil at 250°C 1.8 MPa with constant stirring, fixed oil loading (38 g) and glycerol loading (20 g), fixed oil to glycerol molar ratio (1:5), fixed acetone loading (20 mL)

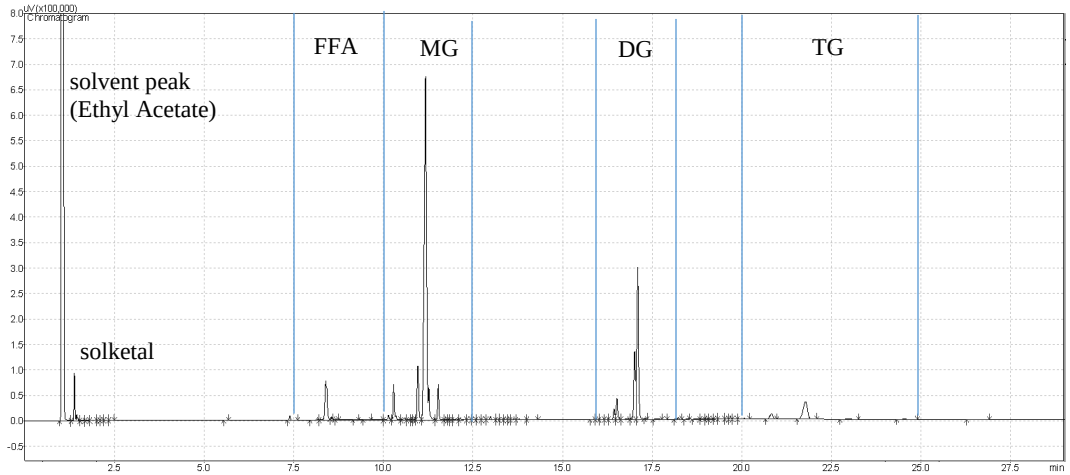

Figure S3. A typical GC chromatogram of glycerolysis products of sunflower oil at 250°C and 1.8 MPa with constant stirring, fixed oil loading (38 g) and glycerol loading (20 g), fixed oil to glycerol molar ratio (1:5), fixed acetone loading (20 mL). Reaction time 2 h.

Supplementary Tables

Table S1. Characteristics of Sunflower Oil

Components (%w/w)	Sunflower Oil
TG	97.8
DG	1.15
MG	-
FFA	-
Unsaponifiables	0.93
Palmitic Acid (C16:0)	6.64 ± 0.09
Linoleic Acid (C18:2)	55.4 ± 0.18
Oleic Acid (C18:1)	35.0 ± 0.13
Stearic Acid (C18:0)	2.96 ± 0.03
Average Molecular Weight of FA (g/mol)	~279.56
Average Molecular Weight of TG (g/mol)	~876.65