

Green Catalysts for the Solvent-free Synthesis of Dietary 1,3(2)-Diacylglycerols

Oi-Ming Lai¹, Seong-Koon Lo², Mohd. Suria Affandi Yusoff² and Razam Latip²

¹Universiti Putra Malaysia, 43400 Serdang, Selangor, Malaysia

²Sime Darby Research Sdn. Bhd., 47200 Banting, Selangor, Malaysia

A new catalyst for the synthesis of dietary 1,3(2)-diacylglycerol is reported. Macroreticular strongly acidic cation exchange resin was used to catalyze the esterification of stearic and oleic acids with glycerol to synthesize 1-stearoyl-3(2)-oleoyl glycerol at significantly lower temperatures than temperatures used in homogenous acid catalyzed reactions. A dual response surface approach was used to optimize the esterification reaction variables. Four variables were optimized using a central composite rotatable design. The following optimized conditions yielded approximately 39 wt. % 1,3(2)-DAG and 2.4 wt. % TAG: reaction temperature of 110 °C, catalyst dosage of 25 wt. %, fatty acid/glycerol molar ratio of 3.0 and reaction time of 1.5 h. Results were repeatable at 10 kg production scale in a pilot packed-bed reactor. No significant losses in catalytic activity or changes in fatty acid selectivity on 1-stearoyl-3(2)-oleoyl glycerol synthesis were observed during the five pilot productions. The catalyst showed high selectivity towards the oleoyl moiety of 1,3(2)-DAG. The purity of 1,3(2)-DAG after purification was 93 wt. %.