SIIC013

FORMATION OF DIHYDROXYSTEARIC ACID (DHSA) FROM EPOXIDIZED PALM OLEIN BY HYDROLYSIS AND ITS KINETIC MODEL

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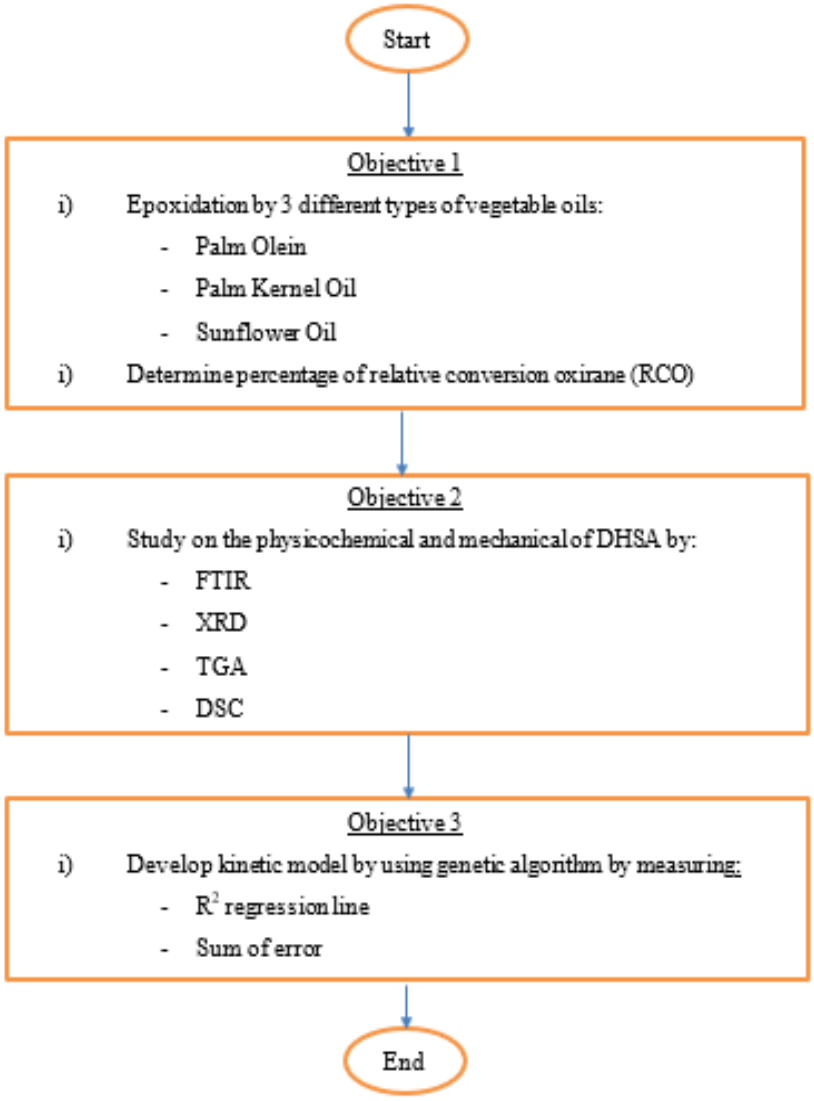
Abstract:
Vegetable oil are mainly used as a raw material for the chemical industry because it is very valuable due to ability of their main components, which is triglycerides and can undergo various reactions to produce a usable product. Epoxy ring opening as known as epoxide cleavage or epoxide ring degradation occurs in the epoxidation of vegetable oils. It is essential to minimize process losses via ring opening in order to obtain good yields and high peroxide values of the epoxidized vegetable oil. DHSA has been successfully produced from palm-based oleic acid via epoxidation with performic acid or peracetic acid with the hydrolysis of the epoxide. Previous researcher patented improved process for the production of palm-based hydroxyl fatty acid (DHSA). This study is conducted to compare the latest result obtained with previous study for a better result. This research paper was conducted to investigate the effect of types of vegetable oil towards epoxidation by using palm olein, palm kernel oil and sunflower oil at optimum condition by using peracid mechanism, to determine physicochemical properties of production dihydroxystearic acid (DHSA) by DSC, XRD and TGA analysis method and to determine reaction kinetic of DHSA production based on different raw materials of vegetable oils. Experiment is conducted in FKK laboratory, molar ratio selected is 1:1:1 for OA:FA:H2O2. Experimental design for the epoxidation and DHSA production undergoes at temperature and stirrer speed which are 50 oC to 75 oC and 300 rpm respectively. Analitycal data need to be concern is the relative conversion to oxirane (RCO) that contain epoxy and final product is DHSA. Product characterization conducted by using pycnometer to determine densities, while X-ray Diffraction (XRD) to determine functional group and Differential Scanning Calorimetry (DSC) and Thermogravimetric Analysis (TGA) to determine thermal analysis. All the spectroscopy spectrum result verified and proved that samples contain epoxy and DHSA functional group, which is the important properties in the product sample. Further research need to be focused in the future to expand the knowledge and obtain more findings of the vegetable oil..

***Keywords*:**
Vegetable oil, Epoxidation, DHSA, Characterization, Analysis

Objectives:

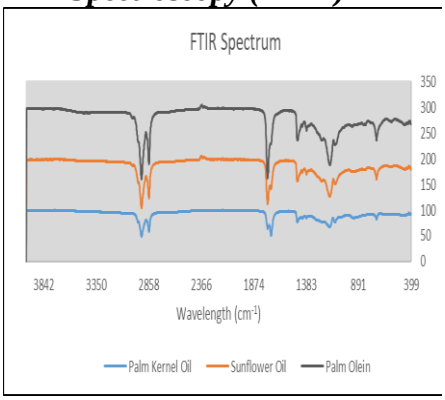
- To investigate the effect of types of vegetable oil towards epoxidation by using palm olein, palm kernel oil and sunflower oil at optimum condition by using peracid mechanism.
- To determine physicochemical properties of production dihydroxystearic acid (DHSA) by FTIR, DSC, XRD and TGA analysis method.
- To determine reaction kinetic of DHSA production based on different raw materials of vegetable oils.

Methodology:

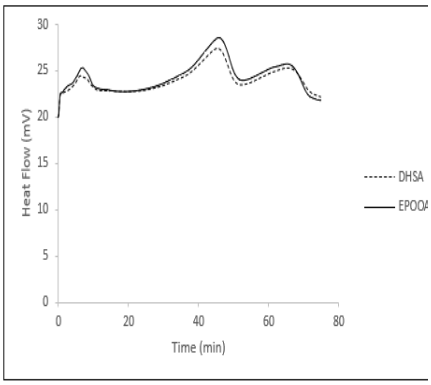


Results:

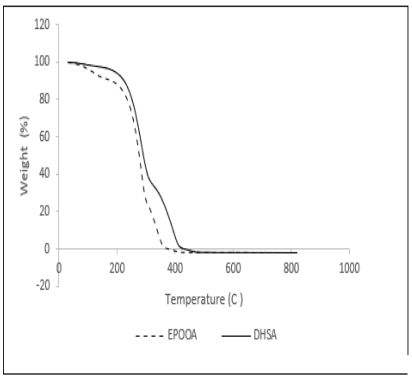
Fourier Transform Infrared Spectroscopy (FTIR)



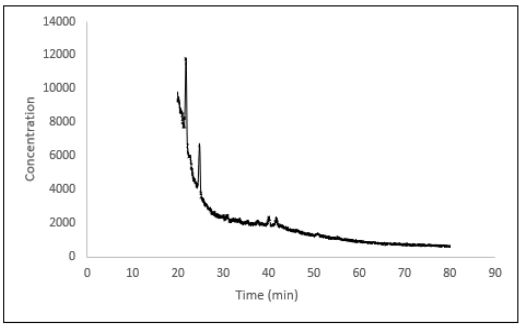
Differential Scanning Calorimetry (DSC)



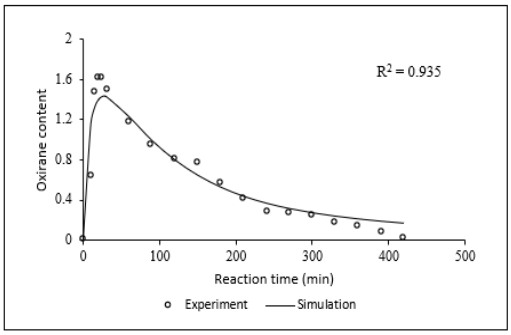
Thermogravimetric Analysis (TGA)



X-Ray Diffraction (XRD)



Kinetic Modelling



Conclusion:

The DHSA purity and yield are improved as well as there is time and cost savings. The physicochemical properties of the raw material and product are characterized to analyze the main function, packaging, validation and vice versa. Futhermore, reaction kinetics shows that there are better chances to produce epoxide and DHSA for large-scale production but the exact concentration of DHSA cannot be determined because it is still under development and investigation.