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OPTIMIZATION OF DIHYDROXYSTEARIC ACID (DHSA) PRODUCTION VIA *IN SITU* HYDROLYSIS OF EPOXIDIZED OLEIC ACID USING TAGUCHI ORTHOGONAL ARRAY DESIGN

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ABSTRACT

Concern regarding the setback of dependency on using fossil fuels as the main resources as the precursor for many derivatives had drawn an attention to further study on production of dihydroxystearic acid (DHSA) by in-situ hydrolysis of epoxidized oleic acid with reaction rate estimate by MATLAB by using 27 data from previous experiment which provide all the parameter involved and optimum parameter later decided by Taguchi method, which are more resource friendly due to low number of experiment need to be done and can further be used as a raw material in cosmetic industry. Epoxidized oleic acid are produced by using *in situ* formed performic acid (HCOOOH), which are the mixture of formic acid (HCOOH) as the oxygen carrier with hydrogen peroxide (H_2O_2) as the oxygen donor. *Ode* 45 method by MATLAB provide the kinetic simulation of the oxirane oxygen ring degradation throughout the epoxidation process with the expected concentration of DHSA produce. Taguchi method further propose the most optimum parameter for DHSA production as in H_2O_2 / oleic acid molar ratio 1.5, HCOOH / oleic acid molar ratio 0.5, reaction temperature at 35 °C with agitation speed at 200 RPM. This setup produce crude DHSA with hydroxyl value of 267 mg KOH/g and further prove by lower hydroxyl value quantity present from non-optimum parameter by Taguchi method where parameters are changed to H_2O_2 / oleic acid molar ratio 0.5 and reaction temperature at 50 °C show lower hydroxyl value content at 172.9 and 263.1 mg KOH/g respectively. DHSA produce, which known as crude DHSA are further purify order for it to be use in cosmetic industry. Physicochemical properties of crude and purify DHSA are compared, where hydroxyl value for purify is higher as compared to crude with 333.1 mg KOH/g and 267 mg KOH/g respectively. Others properties such as higher iodine value in crude compared to purified also proven with value 8.9 to 3.7 respectively, and the form or particle size which show the most significance properties where it is semi solid for crude DHSA and white powder form with particle size of 125-63 µm for purify DHSA. Overall, purify DHSA was successfully produce from oleic acid with low number of running experiment due to prediction by MATLAB and Taguchi method on the reaction rate and the most optimum parameter for epoxidation process.

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