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Jl. Raya Rungkut Madya - Gunung Anyar
Surabaya 60295
Telp. (031) 8782179
Homepage
www.upnjatim.ac.id
E-mail
tk_upn_jatim@yahoo.com
jur_tekim@upnjatim.ac.id

Penerbit
Jurusan Teknik Kimia - Fakultas Teknologi Industri
UPN "Veteran" Jawa Timur

OPTIMASI SUHU DAN KONSENTRASI ÁSAM ASETAT PADA REAKSI EPOKSIDASI METIL ESTER MINYAK SAWIT

TEMPERATURE AND ACETIC ACID CONCENTRATION OPTIMIZATION IN THE EPOXIDATION REACTION OF PALM OIL METHYL ESTER

Edy Purwanto, Emma Savitri, dan Christopher Aditya Sivananda

Jurusan Teknik Kimia, Fakultas Teknik, Universitas Surabaya
Jalan Raya Kalirungkut 60293 Surabaya, Telepon. (031)2981158, Faks. (031) 2981178
email: edypurwanto@ubaya.ac.id

ABSTRAK

Minyak nabati kaya akan kandungan asam lemak tak jenuh dari jenis asam oleat, linoleat, dan linolenat yang dapat dikonversi menjadi gugus senyawa epoksida. Minyak epoksida memiliki banyak kegunaan diantaranya sebagai plastisizer untuk memperbaiki fleksibilitas, elastisitas, dan stabilitas bahan karena pengaruh panas dan radiasi. Pada penelitian ini, minyak sawit dikonversi terlebih dahulu menjadi metil ester minyak sawit (MEMS) dan kemudian dilanjutkan reaksi epoksidasi menghasilkan metil ester minyak sawit terepoksidasi (MEMST). Metode response surface digunakan untuk optimasi dan mempelajari pengaruh suhu reaksi dan rasio mol MEMS/CH₃COOH terhadap konversi reaksi dan bilangan oxirane. Kondisi reaksi yang optimal ditunjukkan oleh kandungan gugus oxirane yang tinggi yaitu bilangan oxirane. Reaksi epoksidasi dilakukan di dalam reaktor batch menggunakan asam asetat sebagai senyawa pembawa oksigen. Central Composite Design (CCD) dengan dua variabel independent dan dua fungsi response digunakan untuk mempelajari pengaruh variabel input. Hasil penelitian menunjukkan konversi reaksi meningkat dengan meningkatnya suhu reaksi dan rasio mol MEMS/CH₃COOH sebelum mencapai titik maksimum dan kemudian turun secara monoton. Kondisi reaksi epoksidasi yang optimal ditunjukkan oleh bilangan oxirane maksimum yang dicapai pada suhu reaksi 56,3°C and rasio mol MEMS/CH₃COOH adalah 1:0,43.

Kata kunci: epoksidasi, metil ester, minyak sawi, t oxirane

ABSTRACT

Vegetable oils are rich in content unsaturated fatty acid from the type of oleic acid, linoleic acid and linolenic acid that can be converted to epoxide groups. Epoxidized oil has many useful applications such as plasticizer to improve flexibility, elasticity and stability under the influence of heat and radiation. In this research, palm oil was converted first to become palm oil methyl ester (POME), followed by epoxidation reaction to produce epoxidized palm oil methyl ester (EPOME). Response surface method (RSM) was performed for optimization and to study the influence of reaction temperature and molar ratio POME/CH₃COOH on the conversion reaction and oxirane value. An optimal reactional condition was shown by high oxirane content which was in the form of oxirane counts/number. Epoxidation reaction was run in the batch reactor using acetic acid as an oxygen carrier. Central Composite Design (CCD) with two independent variables and two response function was utilized to investigate the effect of input variables. The result shows that reaction conversion increased with the rise of reaction temperature and molar ratio of POME/CH₃COOH before reaching the maximum point, and then it monotonously decreased. The optimal operating condition for epoxidation reaction was indicated by maximum oxirane value which could be reached by the reaction temperature of 56.3 °C and molar ratio POME/CH₃COOH of 1:0.43

Key words: epoxidation, methyl ester, oxirane, palm oil