

## Produksi metil kafeat sebagai produk intermediat untuk memproduksi caffeic acid phenethyl ester dengan esterifikasi menggunakan cation-exchange resin = Production of methyl caffeate as an intermediate product to produce caffeic acid phenethyl ester by esterification using cation-exchange resin

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### Abstrak

Caffeic acid dapat dianggap sebagai natural anti-oxidant yang esensial. Namun, rendahnya solubilitas dan stabilitas caffeic acid di berbagai macam pelarut membatasi aplikasi pada industri. Sintesis dari alkyl ester caffeic acid sangat menguntungkan berdasarkan fungsi biologis maupun potensi aplikasinya. Salah satu turunan dari caffeic acid, caffeic acid phenethyl ester CAPE merupakan senyawa dengan banyak aktivitas biologis yang berguna. Metode untuk mensintesis CAPE adalah dengan esterifikasi menggunakan katalis ion exchange resin. Tahap pertama merupakan esterifikasi dari caffeic acid dengan metanol untuk memproduksi metil kafeat. Kondisi reaksi dan parameter kinetika untuk reaksi sintesis metil kafeat dengan methanol menggunakan cation-exchange resin sebagai katalis akan dianalisis dan produk metil kafeat dikonfirmasi menggunakan Ultra Performance Liquid Chromatography UPLC. Kondisi optimum dimana produk metil kafeat tertinggi dihasilkan adalah sebagai berikut: suhu reaksi 60 C dan waktu reaksi 4 jam. Kinetika reaksi diasumsikan menggunakan pseudo-homogenous first order model dan hubungan antara suhu dan forward rate constant menghasilkan energi aktivasi 51 kJ/mol. Hasil tersebut mengindikasikan bahwa cation-exchange resin memiliki aktivitas katalisis yang tinggi.

Caffeic acid CA could be considered as an important natural anti oxidant. However, the low solubility and stability of CA in various solvent is limiting the application in industry. It is advantageous to synthesize alkyl ester of caffeic acid based on both their biological function and potential application. One of the caffeic acid derivatives called caffeic acid phenethyl ester CAPE is a compound with numerous important biological activities. To synthesize CAPE one of the method used is catalyzed esterification of caffeic acid and phenethyl alcohol using ion exchange resin catalyst. The first step of the process is to perform esterification of caffeic acid and methanol to produce methyl caffeate MC. MC would then be used to produce CAPE in the presence of phenethyl alcohol. Herein, the reaction condition and kinetic parameters for the synthesis of MC using cation exchange resin as a catalyst were investigated, and the product was confirmed by ultra performance liquid chromatography UPLC. The highest yield of MC catalyzed by cation exchange resin attained under the optimum condition as follows reaction temperature of 60 C and a reaction time of 4 h. The esterification kinetics of CA and methanol is described by the pseudo homogenous first order model. The relationship between temperature and the forward rate constant gives activation energy of 51 kJ mol. These results indicated that cation exchange resin possesses high catalytic activity in the synthesis of MC, which is an efficient catalyst suitable for MC production.