

**REACTION TIMES STUDY FOR SYNTHESIS OF CASTOR OIL
MODIFIED MALEIC ANHYDRIDE AND ITS APPLICATIONS AS A
PLASTICIZER FOR NATURAL RUBBER**

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ABSTRACT

Synthesis of castor oil modified maleic anhydride and its applications as a plasticizer for natural rubber have been carried out. This research aimed to synthesize castor oil modified maleic anhydride as an alternative plasticizer, investigated the effect of synthesis time on the characters of maleated castor oil, and studied its performance as a natural rubber plasticizer.

Plasticizers were synthesized by modified castor oil with maleic anhydride. Synthesis was carried out by refluxing castor oil and maleic anhydride with time variable. The products were characterized by Fourier Transform Infrared (FTIR) spectrophotometer and ¹H-NMR spectrometer. Applications of plasticizers were carried out through a compounding process. The products were characterized by Moving Die Rheometer, mechanical test, swelling and exudation test.

The results obtained in this research were maleated castor oil compounds in the form of clear yellow liquid. Viscosity values of synthesis time 1,2,4,6, and 8 hours were 919.8; 969.8; 1070; 1080; and 1350 cP. Curing characteristic, mechanical test, swelling, and exudation test were studied. The results showed that maleated castor oil has given similar performance to paraffinic oil as a plasticizer, so that maleated castor oil is feasible used as an alternative plasticizer for natural rubber.

Keywords: castor oil; maleated castor oil; maleic anhydride; plasticizer.

**STUDI WAKTU REAKSI PADA SINTESIS MINYAK JARAK
TERMODIFIKASI MALEAT ANHIDRIDA DAN APLIKASINYA
SEBAGAI BAHAN PEMLASTIS KARET ALAM**

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INTISARI

Telah dilakukan sintesis *maleated castor oil* dan aplikasinya sebagai bahan pemlastis karet alam. Penelitian ini bertujuan untuk melakukan sintesis minyak jarak termodifikasi maleat anhidrida sebagai bahan pemlastis alternatif, mengetahui pengaruh waktu sintesis terhadap karakter *maleated castor oil* hasil sintesis, dan mempelajari performa *maleated castor oil* sebagai bahan pemlastis karet alam.

Penelitian diawali dengan sintesis bahan pemlastis dari minyak jarak yang dimodifikasi dengan maleat anhidrida. Sintesis dilakukan dengan merefluks minyak jarak dan maleat anhidrida dengan waktu divariasikan. Karakterisasi hasil dilakukan dengan spektrofotometer *Forrier Transform Infrared* (FTIR) dan spektrometer $^1\text{H-NMR}$. Aplikasi bahan pemlastis pada karet dilakukan melalui proses pengomponan kemudian dilakukan karakterisasi dengan *Moving Die Rheometer*, uji mekanik, *swelling* dan *exudation test*.

Senyawa *maleated castor oil* yang diperoleh berupa cairan berwarna kuning bening. Semakin lama waktu sintesis, maka viskositasnya semakin meningkat. Nilai viskositas dari waktu sintesis 1,2,4,6, dan 8 jam berturut-turut yaitu 919,8; 969,8; 1070; 1080; dan 1350 cP. Dari hasil uji karakteristik pematangan kompon, uji mekanik, *swelling*, dan *exudation test* disimpulkan bahwa *maleated castor oil* memberikan performa yang mirip dengan bahan pemlastis konvensional minyak parafinik sehingga *maleated castor oil* layak digunakan sebagai bahan pemlastis alternatif pada karet alam.

Kata kunci: maleat anhidrida; *maleated castor oil*, minyak jarak; bahan pemlastis.