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Omar S. Dahham, Rosniza Hamzah, Mohamad Abu Bakar, Nik Noriman Zulkepli, Saad S. Dahham, Sam Sung Ting



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Analysis Method

NMR study of ring opening reaction of epoxidized natural rubber in presence of potassium hydroxide/isopropanol solution

Omar S. Dahham^{1a}, Rosniza Hamzah^{1b}, Mohamad Abu Bakar^{2c}, Nik Noriman Zulkepli^{1d}, Saad S. Dahham^{3e}, Sam Sung Ting^{4f}

¹Center of Excellence Geopolymer and Green Technology, Faculty of Engineering Technology, Universiti Malaysia Perlis, 02100 Padang Besar, Perlis, Malaysia

²Nanoscience Research Laboratory, School of Chemical Sciences, Universiti Sains Malaysia, 11800 Minden, Penang, Malaysia

³EMAN Research and Testing Laboratory, School of Pharmaceutical Sciences, Universiti Sains Malaysia, 11800 Minden, Pulau Pinang, Malaysia

⁴School of Bioprocess Engineering, Universiti Malaysia Perlis (UniMAP), Kompleks Pengajian Jejawi 3, 02600 Arau, Perlis, Malaysia

^aeng.omar@mail.com, ^brosnizahamzah@unimap.edu.my, ^cbmohamad@usm.my,
^dniknoriman@unimap.edu.my, ^ehawk_dijla@yahoo.com, ^fstsam@unimap.edu.my

Correspondence to:

Name: Rosniza Hamzah

E-mail: rosnizahamzah@unimap.edu.my

Abstract: The ring opening reaction of epoxidized natural rubber (ENR-50) in the presence of potassium hydroxide/isopropanol solution was studied using NMR, and its thermal characteristic was investigated using TG/DTG and DSC. ¹H-NMR showed that 16.9% of epoxide units was ring-opened in treated ENR-50, which was also supported by quantitative FTIR spectroscopy. ¹³C-NMR proved the location of alkyl group (isopropyl) in the polymer chain of treated ENR-50. The attachment location of isopropyl occurred at both most (↑) and least (↓) hindered carbons of the epoxide. 2D-NMR was used to identify and scrutinize the triad assignment of treated ENR-50. The TG/DTG results presented three decomposition steps at 190-331, 331-521 and 521-706 °C due to the existence of mixtures of polymer chains i.e. ring-opened and intact epoxide of ENR-50, which also led to increase in T_g of treated ENR-50 at 13.2°C compared with purified ENR-50 at -17.7°C.

Keywords: epoxidized natural rubber, ring opening reaction, epoxide, nuclear magnetic resonance, thermal characteristic.

1.Introduction

Nuclear magnetic resonance spectroscopy (NMR) techniques are extensively used for polymeric materials characterization either in solid or liquid phase. 1D NMR provides structural explanation on monomer units and reactive groups in the polymer chain. 2D NMR gives detail structural arrangements on the monomer units in the polymer chain. The 1D NMR technique or both 1D NMR and 2D NMR techniques were

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