



**CHEMICAL DEGRADATION OF NATURAL RUBBER UNDER SUPERCRITICAL CARBON DIOXIDE  
BASED HYDROXYTELECHELIC NATURAL RUBBER: STUDY TO PREPARING THE POLYURETHANE  
FOAM**

Chokchai Boonchuay and Surat Areerat\*

*School of Chemical Engineering, Faculty of Engineering, King Mongkut's Institute of Technology Ladkrabang, Bangkok,  
10520, Thailand*

[kasurat@kmitl.ac.th](mailto:kasurat@kmitl.ac.th)

Recently, the hydroxyltelechelic natural rubber (HTNR) as a renewable source is interested for used as polyurethane precursor. In this work, the HTNR for used as polyols based flexible polyurethane foam (PUF) were obtained with oxidative degradation of natural rubber (NR) in the presence of supercritical carbon dioxide (scCO<sub>2</sub>). Based HTNR polyols is a kind of prepolymer whose structure determines the final PU foam properties with related to its molecular weight and functionality. Hydrogen peroxide as the oxidant reacted with NR/toluene solution in scCO<sub>2</sub> medium. Three parameters in the oxidative degradation process, composition of hydrogen peroxide, reaction time and temperature at a constant pressure 120 bar, were studied. Decreasing in molecular weight down to  $1.05 \times 10^4 \text{ g.mol}^{-1}$  and molecular weight distribution of the HTNR were analyzed by gel permeation chromatography (GPC). The hydroxyl group of the HTNR was analyzed by FT-IR and <sup>1</sup>H-NMR spectroscopy. From degree of depolymerization and kinetics studies, the activation energy of oxidative degradation reaction in scCO<sub>2</sub> was  $37.55 \text{ kJ mol}^{-1}$ . Moreover, the preparation of HTNR based flexible polyurethane foams (PUF) by a one-shot technique, were studied. The cell size, cell density, and cell size distribution inside the PUF were obtained by Scanning electron microscopy (SEM). The thermal stability of PUF was investigated by using Thermogravimetric analysis (TGA).