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Strain-induced crystallization of natural rubber: Effect of proteins and phospholipids

Suratwadee Sriwarom and Jitladda Sakdapipanich
Mahidol University, Thailand

Natural Rubber (NR), obtained from *Hevea brasiliensis* and synthetic IR consist of *cis*-1, 4-polyisoprene as a major component. For NR, it consisted of many Non-Rubber Components (NRCs) such as proteins, lipids, carbohydrate and inorganic compounds, affecting directly their mechanical properties, whereas IR did not have NRCs. The final product of NR usually exhibited excellent properties, such as high tensile and tear strength and minimal heat buildup, often superior to synthetic Polyisoprene (IR). The different properties of NR and IR are related to the formation of network structure from proteins and phospholipids through intermolecular hydrogen bonding in NR. Therefore, the effect of proteins and phospholipids on Strain-Induced Crystallization (SIC) of un-vulcanized NR was investigated in this work. NR was eliminated protein and phospholipid by using deproteinization and trans- esterification, respectively. Fourier-Transform Infrared Spectroscopy (FTIR) was used to confirmed successful destruction of protein and phospholipid in NR. The behavior of molecular model and SIC of un-vulcanized NR was characterized by using Wide-Angle X-ray Diffraction (WAXD) techniques. Moreover, the SIC behavior in un-vulcanized NR was investigated in tensile strength by performing tensile testing. It was found that crystallizability decreased with the removal of protein and disappeared in transesterificated-DPNR (TE-DPNR). Additionally, both of deproteinized NR (DPNR) and TE-DPNR showed that very low tensile strength. Overall, the naturally occurring network, formed by proteins and phospholipids, is responsible for high stress-strain behavior and crystallization under deformation of un-vulcanized NR.

Biography

Suratwadee Sriwarom is currently pursuing her studies at Department of Chemistry, Faculty of Science, Mahidol University, Thailand.

jitladda.sak@mahidol.ac.th

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