# The Attractive Influence of Small Rubber Particles on The Green and Vulcanized Properties of Natural Rubber

Mridul Pant[1], Jitladda Sakdapipanich [1]

e-mail: jitladda.sak@mahidol.edu

[1] *Polymer Science and Technology Program, Department of Chemistry, Faculty of Science, Mahidol University, Nakhon Pathom, 73170, Thailand*

## Abstract

Large rubber particles (LRP) and small rubber particles (SRP) were prepared from freshly tapped natural rubber (NR) latex with 0.6% ammonia by ultracentrifugation. The influence of particle sizes on the green and vulcanized properties of NR was investigated by mixing LRP and SRP at different ratios. Differences in the basic components and nature of LRP and SRP played significant roles in both green and cured properties. For green properties, modulus and tensile strength reached their highest values at an 80:20 w/w ratio (LRP:SRP), then declined when SRP exceeded 20% w/w. This promotion of tensile properties might be attributed to strain-induced crystallization (SIC) and good film formation efficiency. Additionally, the storage modulus (G') at the linear viscoelastic region (LVE) was directly proportional to SRP content, whereas LVE duration was disproportional. Regarding cure properties, rubber vulcanizates were prepared using a sulfur system. Properties including crosslinking density, tensile properties, and thermal aging resistance were highlighted. Higher protein content in samples with higher SRP resulted in higher crosslinking density, contributing to greater tensile properties. In summary, NR composed of LRP and SRP at a 70:30 w/w ratio enhanced the heat aging resistance of vulcanized NR efficiently.