Abstract Submitted
for the MAR12 Meeting of
The American Physical Society

New Insights into Chain Order Dynamics and Structural Development in Sulfur-Vulcanized Natural Rubber Latex using Multiple Quantum NMR and Synchrotron X-Ray Diffraction JUSTIN CHE, SHIGEYUKI TOKI, Stony Brook University, JUAN VALENTIN, JUSTO BRASERO, Instituto de Ciencia y Tecnología de Polímeros (CSIC), LIXIA RONG, BENJAMIN S. HSIAO, Stony Brook University, STONY BROOK UNIVERSITY TEAM, INSTITUTO DE CIENCIA Y TECNOLOGÍA DE POLÍMEROS (CSIC) COLLABORATION — Network structure, chain dynamics, and structural development in sulfur-vulcanized natural rubber latex were studied by Multiple-Quantum (MQ) NMR and synchrotron x-ray scattering. Three important processes that can influence rubber network structure and its overall mechanical properties were the main focus and analyzed by both of these techniques: pre-vulcanization, drying, and post-vulcanization. MQ NMR experiments can provide quantitative information regarding networks at very small length scales, including network defects, number of cross-links, and spatial distribution of cross-links. Structural development in natural rubber was studied under uniaxial deformation by in-situ synchrotron x-ray diffraction, which can provide information on network structures at much larger length scales. Molecular orientation and strain-induced crystallization was analyzed by both stress-strain relations and wide-angle x-ray diffraction (WAXD). The morphology of the latex rubber particle during deformation was analyzed by small-angle x-ray scattering (SAXS). The combination of these techniques can provide a considerable amount of information regarding rubber network structure.

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Date submitted: 19 Nov 2011 Electronic form version 1.4