Abstract Submitted
for the MAR13 Meeting of
The American Physical Society

The Interesting Influence of Nanosprings on the Viscoelasticity of Elastomeric Polymer Materials: Simulation and Experiment JUN LIU, LIQUN ZHANG, DAPENG CAO, Beijing University of Chemical Technology, Beijing, China — Among all carbon nano-structured materials, helical nanosprings or nanocoils have attracted particular interest. Here, carbon nanosprings are directed to adjust the viscoelasticity and reduce the resulting hysteresis loss (HL) of elastomeric polymer materials. Two kinds of nanosprings filled elastomer composites are constructed: system I is obtained by directly blending polymer chains with nanosprings, while system II is composed of the self-assembly of the tri-block structure (chain-nanospring-chain). Through coarse-grained molecular dynamics simulation, we find that the incorporation of nanosprings prominently improve the mechanical strength of the elastomer matrix, and importantly, decrease considerably the hysteresis loss. Furthermore, the spring constant of nanosprings and the interfacial chemical coupling between chains and nanosprings both play a crucial role. It is inferred that elastomer/carbon nano-structured materials with good flexibility and reversible mechanical response (nanosprings, nanocoils, nanorings and thin graphene sheet) may possess both excellent mechanical and low HL properties, which could open a new avenue to fabricate high performance automobile tires, and facilitate the large-scale industrial application of these materials.

Jun Liu
Beijing University of Chemical Technology, Beijing, China

Date submitted: 07 Nov 2012 Electronic form version 1.4