Abstract Submitted
for the MAR16 Meeting of
The American Physical Society

Nanostructures and dynamics of macromolecules bound to attractive filler surfaces[1] TAD KOGA, DEBORAH BARKLEY, NAISHENG JIANG, MAYA ENDOH, Stony Brook University, TOMOMI MASUI, HIROYUKI KISHIMOTO, Sumitomo Rubber Industries Ltd., MICHIHIRO NAGAO, SUSHIL SATIJA, NIST Center for Neutron Research, TAKASHI TANIGUCHI, Kyoto University — We report in-situ nanostructures and dynamics of polybutadiene (PB) chains bound to carbon black (CB) fillers (the so-called "bound polymer layer (BPL)") in a good solvent. The BPL on the CB fillers were extracted by solvent leaching of a CB-filled PB compound and subsequently dispersed in deuterated toluene to label the BPL for small-angle neutron scattering and neutron spin echo techniques. Intriguingly, the results demonstrate that the BPL is composed of two regions regardless of molecular weights of PB: the inner unswollen region of ≈ 0.5 nm thick and outer swollen region where the polymer chains display a parabolic profile with a diffuse tail. This two-layer formation on the filler surface is similar to that reported for polymer chains adsorbed on planar substrates from melts [1]. In addition, the results show that the dynamics of the swollen bound chains can be explained by the so-called "breathing mode" and is generalized with the thickness of the swollen BPL. Furthermore, we will discuss how the breathing collective dynamics is affected by the presence of polymer chains in a matrix solution. [1] Gin et al., Phys. Rev. Lett., (2012), 109, 265501.

[1]We acknowledge the financial support from NSF Grant No. CMMI-1332499.

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Date submitted: 05 Nov 2015 Electronic form version 1.4