Poster Presentation

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Spatio-temporal Structure of Filler in Rubber Studied with X-ray Scattering

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Filler nanoparticles such as carbon black and silica play a vital role in the reinforcement effect of rubber, whereby its viscoelastic and mechanical properties are dramatically improved. The reinforcement effect is of great importance for developing rubber products such as vehicle tires. Its mechanism, however, has not been clarified despite a large number of studies. We have aimed at elucidating the mechanism by clarifying the spatio-temporal hierarchical structure of filler nanoparticles in rubber with various X-ray scattering techniques: ultra-small-angle X-ray scattering (USAXS) for elucidating the hierarchical structures of filler aggregates and their deformation under stretching, and X-ray photon correlation spectroscopy (XPCS) for observing the translational and rotational dynamics of nanoparticles in rubber. For that purpose, we have developed time-resolved two-dimensional USAXS at BL20XU [1] and XPCS at BL40XU, SPirng-8 [2, 3]. Based on the results of these novel scattering experiments, we have characterized spatio-temporal structure of filled rubber system, thereby developing tire products. In this presentation, experimental details and their results will be presented.

[1] *H. Kishimoto, Y. Shinohara Y. Suzuki et al., Journal of Synchrotron Radiadion, 2014, 21, 1-4,* ***[2]*** *Y. Shinohara, R. Imai, H. Kishimoto et al., Journal of Synchrotron Radiation, 2010, 17, 747-742,* ***[3]*** *Y. Shinohara, A. Watanabe, H. Kishimoto et al., Journal of Synchrotron Radiation, 2013, 20, 801-804*

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