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Fundamentals of the reinforcement of hairy nanoparticles in rubber compounds XIAORONG WANG, Bridgestone Americas, Center for Research and Technology, 1200 Firestone Parkway, Akron, OH 44317-0001, USA. Email: WangXiaorong@BFUSA.com — The reinforcement of nano-sized polymeric hard core-hairy shell particles in a polymer matrix of chemically identical chains was investigated by dynamical mechanical measurements. We found that the magnitude of reinforcement depended strongly on the phase behavior of the nanoparticles in the polymer matrix. In one phase region, the mechanical response was nearly linear, and the reinforcement was approximately described by the Guth- Smallwood relationship in terms of filler concentration. In two phase region, however, the mechanical response was largely nonlinear, even for strain lower than 1%, and the reinforcement at low strains was an exponential function of the filler concentration. We show that by tailoring the filler interaction potentials the entire reinforcing mechanism can be changed.

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