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Synthesis of Polymeric Nanoparticles by Self-Assembly in Solution of Living Block Copolymers and Application of the Particles in Rubber Compounds XIAORONG WANG, JAMES HALL, SANDRA WARREN, JAMES KROM, JEFFERY MAGISTRELLI, MINDAUGAS RACKAITIS, GEORG BOHM, Bridgestone Americas, Center for Research & Technology — Over the past number of years, we attempted to extend the self- assembly concepts of macromolecules in solutions to create nano- sized particles through industrially viable processes of significance for different applications. Depending on the type and macrostructure of the block-copolymers, the solvent, the concentration and other process parameters, a variety of core- shell nano-particles of different shapes (spheres, hollow spheres, ellipsoids, linear and branched strings etc.) and sizes have been reproducibly synthesized. Most of the nanoparticles were composed of a solid, highly crosslinked core and an elastomeric shell structure. The evolution and structure of the nano-particles during the different process steps involved were examined and characterized. The unique performance of spherical nanoparticles as performance enhancing additives and novel reinforcing agents was explored in rubber compounds. The mechanism of the reinforcement and the phase behavior of the particles in polymer matrices are also discussed.

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