

# Structure and properties of highly-filled simplified industrial nanocomposites

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Polymer nanocomposites are of widespread use, namely for the industrial application of car tires. The rheological behavior of such nanocomposites depends in a crucial way on the dispersion of the hard filler particles – typically silica nanoparticles embedded in a soft polymer matrix. It is thus important to assess the filler structure, which may be quite difficult for aggregated nanoparticles of non spherical shape and possibly high polydispersity. For the sake of completeness, a short introduction on the structure of polymer chains in nanocomposites as seen by SANS will also be given.

We will then present a coupled TEM-SAXS structural model which we have recently developed to describe the filler microstructure of simplified industrial nanocomposites [1] with silica of high structural disorder. The model will be applied to highly filled samples, with various degrees of polymer grafting [2]. Both filler content and grafting are found to impact the rheological properties, and we have found surprising evidence for the existence of a key parameter governing both structure and (some) rheological properties. An outlook on the dynamical properties of these systems as studied by dielectric spectroscopy will also be given.

[1] Multiscale Filler Structure in Simplified Industrial Nanocomposite Silica/SBR Systems Studied by SAXS and TEM, Guilhem P. Baeza, Anne-Caroline Genix, Christophe Degrandcourt, Laurent Petitjean, Jérémie Gummel, Marc Couty, Julian Oberdisse, *Macromolecules* 2013, 46, 317–329

[2] Effect of Grafting on Rheology and Structure of a Simplified Industrial Nanocomposite Silica/SBR, Guilhem P. Baeza, Anne-Caroline Genix, Christophe Degrandcourt, Laurent Petitjean, Jérémie Gummel, Ralf Schweins, Marc Couty, Julian Oberdisse, *Macromolecules* 2013, 46, 6621–6633