



Polymers under Multiple Constraints

# Polymer- & Soft-Matter-Seminar

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### “Isostructural Softening of the Filler Network in SBR/Silica Nanocomposites”

**Tuesday,  
19<sup>th</sup> February  
2019**

**at: 5.15pm**

**VDP 4 1.27,  
Von-Danckelmann-Platz 4,  
06120 Halle**

A new formulation of the widely used nanocomposites based on SBR and fractal silica fillers is proposed by substituting the usual covering and coupling agents with short chains ( $4 \text{ kg}\cdot\text{mol}^{-1}$ ) of polypropylene glycol (PPG) oligomers. We study in a systematic way the structural evolution as well as the changes in linear and non-linear mechanical properties of two series of samples varying: (i) the silica volume fraction in PPG-free samples, and (ii) the amount of PPG for a given silica content of 15 vol.%. While the first series are used as a reference, showing expected trends (e.g. enhancement of the plateau modulus), the second series reveal in contrast, a surprising PPG insensitivity, both in terms of fillers structure (investigated by means of SAXS, SEM and TEM) and properties “at rest” (linear rheology). However, increasing the strain amplitude (both in shear and tensile tests) discloses the great effect of the oligomers, opening possibly the way to a fruitful decorrelation between the low and high deformation performances of tires. Although this study is limited to the investigation of uncrosslinked materials, it can be extended to more operative industrial formulations.



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