Impact of nonlinear viscoelastic models on the prediction of contact forces involving elastomers in large deformation

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A new experiment has been recently developed in [1] to study the mechanical response of filled elastomers in sliding contact over smooth obstacles. Its objective was to highlight and assess the influence of finite deformations and of the complex viscoelastic behavior of filled elastomers in such conditions. The purpose of the talk is to present the results of this experiment, and discuss on the full field simulations which were performed for its interpretation. We do observe large deformations in the specimen occurring during a pre-indentation phase whose long term relaxation strongly affects the resulting evolution of the overall friction force. We will also see the numerical predictions obtained with viscoelastic models based on a collection of Maxwell branches with constant viscosities are significantly different to those using more elaborate nonlinear viscosities. The latter do improve the quality of the prediction as function of the sliding velocity, but also seem to indicate that some improvement must still be done to better handle the coupled dependence of the viscosity coefficients to both strain and strain rate magnitude.

[1] *M. de Lorenzo, P. Le Tallec, O. Lopez-Pamies, P. Bussetta,*
Filled elastomers sliding over smooth obstacles: Experiments and modeling in large deformations, Journal of the Mechanics and Physics of Solids, Volume 193, December 2024.