Séminaire
Batiment Jacqueline Ferrand
INSA de Lyon
Amphi. Clémence Royer (1er étage)
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Physically based modeling of rubber-like materials

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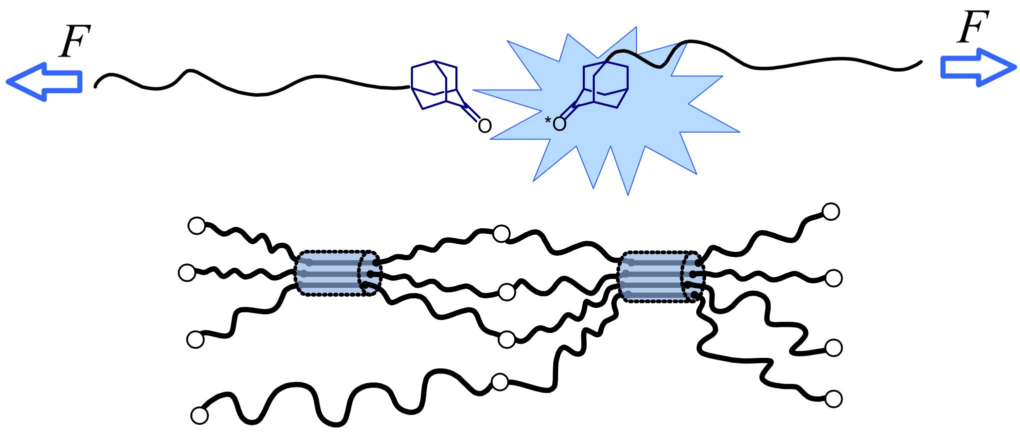

Rubber-like materials exhibit many elastic and inelastic phenomena like for example the Mullins effect, induced anisotropy, permanent set and strain-induced crystallization. Recently, special attention has also been focused to mechanoluminescence. The latter one is a phenomenon where broken chemical bonds emit visible light upon stress application. In this contribution, we propose a physically based constitute model able to capture all these effects within a single constitutive formulation. The model is based on a quantum mechanics motivated closed-form approximation of the exact non-Gaussian distribution function. Another important feature of the model is an analytical network averaging concept which enables scale transition without numerical integration. The network averaging takes into account an irreversible evolution in the spatial distribution of polymer molecules due to the inelastic effects. The model includes a few number of physically interpretable material parameters and demonstrates good agreement both with experimental data and with molecular dynamics simulations.