

Laboratoire MATEIS
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3 years Ph.D. Thesis at MATEIS, INSA-Lyon, France

Experience/Simulation Dual Approach of the Dynamic Properties of Thermoplastic Elastomers:

Scientific Project:

The name “thermoplastic elastomer” (TPE) refers to polymeric materials exhibiting a dual rubber/melt rheological behavior as opposed to classic vulcanized rubbers. Their high elasticity and flexibility at operating temperature reflects thermo-reversible phase separation (hard/soft segments), which gives rise to rubber-like properties without involving chemical crosslinks. This reversibility makes the TPEs good candidates for a more sustainable rubber production in particular in terms of reshaping and recycling many daily consumer goods. Besides, they are expected to play a key role in emerging technologies such as 3D-printing or in the development of solid-state-batteries.

In this project, we will investigate the relationship between several physical properties of TPEs (mechanical, electrical) and their multi-scale structure as well as the role of the chain mobility at different length scales. To achieve this aim, we will use both experimental and modeling approaches. While the former will consist in characterizing various TPEs through mechanical and dielectric spectroscopy as well as low-field NMR and X-ray scattering, the latter will focus on coarse-grained simulations in order to investigate the physical mechanisms responsible for the phase separation under different conditions.

Although all the experimental techniques and simulation facilities are available in our laboratory in Lyon (MATEIS), the successful candidate will have the opportunity to travel to other laboratories via international collaborations and possible stays on large instruments. Also, he will have the opportunity to teach at INSA, this will be discussed with the research team during the first meeting.

The recruitment must be done as soon as possible. The beginning of the thesis is planned for September 2017.

Location: Lyon, 20 minutes from the city center.

Duration: 3 years

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Funding: French Ministry of Research and Higher Education – (net wage: ≈1500€/month).

Key words: Copolymer, Thermoplastic Elastomers, Dynamic, Coarse-grained simulation, dielectric, rheology

Required skills: Interest in polymer materials and computational work, with either a strong background in physical chemistry or mechanics.