

Ph-D position for a thesis in collaboration between Michelin and MATEIS Laboratory (INSA de Lyon) : **multi-frequency response of multiphasic elastomer systems.**

Context : This project is built in the frame of researches on the impact of the multiphasic character of elastomers on their performance, when they are used in tires parts. This multiphasic character may be one possibility to control the tires rolling resistance and grip properties. Involved in the Michelin/Insa de Lyon chair, the MATEIS laboratory and its polymer team has a strong expertise in the field of relaxational mechanisms (mechanical and dielectrical) in polymer based materials, and in the microstructural characterization of these systems (from the molecular to macroscopic scale) through X-ray scattering and microscopy techniques (For instance see J. Ramier and C. Souillard Ph-D thesis).

Topic : The aim of this Ph-D thesis is to propose new conception route for elastomers whose the optimal multi-frequency response will be controlled by the use of a multiphasic system. In particular, one wishes to decorrelate the temperature frequency/domain involved in the rolling resistance from the one involved in the grip.

To do so, it is necessary to characterize the structuration of these multiphasic systems at different scales, and to understand how this structuration, in combination with the dynamic response of each phase, pilots the macroscopic response on a large temperature and frequency domain. A first step will be devoted to this characterisation using the numerous techniques available at MATEIS (Atomic force microscopy, Transmission and environmental microscopy, 3D characterization technique via the use of X-ray and electron tomography and Slice&View technique in a FIB-ESEM...). The pertinent parameters describing the microstructure will be used in a second step to understand the multi-frequency response of the materials. Models will be developed coupling the microstructure and the phase responses (viscoelasticity and continuum mechanics). This will be done in the linear and non-linear response domain.

Supervisors: Prof. L. Chazeau and Dr. JM. Chenal , from MATEIS laboratory, in collaboration with: Dr N. Malicki, Dr E. Lecocq, Prof. C. Gauthier from Michelin

Contacts: Laurent Chazeau (laurent.chazeau@insa-lyon.fr), Jean-Marc Chenal (jean-marc.chenal@insa-lyon.fr), (please send a mail to the 2 addresses)

Grant type: Thèse CIFRE (around 2500 € brut/month), starting as soon as possible

Key words: Elastomers, incompatible blends, viscoelastic and dielectric response, microstructural characterisation

Required skills: the candidate should hold a Master degree in “materials science” and or “materials mechanics”. Skills in the polymer field will be highly appreciated : polymer physics, and/or polymer rheology and processing, and/or polymer mechanics.

The candidate should send a complete CV, a motivation letter, his/her evaluation marks during Master, and possibly a recommendation letter or persons to contact.