



Secteur des Sciences
et Technologies

Invitation à la soutenance publique de thèse de
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Master in Polymer Engineering

Pour l'obtention du grade de Docteur en sciences de l'ingénieur et
technologie

« Controlling the Viscoelastic Properties of Supramolecular Networks
based on Topological or Metallo- Supramolecular Associations »

qui se déroulera
le lundi 12 avril 2021 à 14h
En visioconférence
1348 Louvain-la-Neuve

Jury members :

Prof. Evelyne Van Ruymbeke (IMCN, UCLouvain), supervisor
Prof. Charles-André Fustin (IMCN, UCLouvain), supervisor
Prof. Jean-François Gohy (IMCN, UCLouvain), chairperson
Prof. Christian Bailly (IMCN, UCLouvain)
Prof. Michael Singleton (IMCN, UCLouvain), secretary
Prof. Ruth Cardinaels (SMART, KULeuven, Belgium)
Prof. Tetsuharu Narita (Laboratoire Sciences et Ingénierie de la
Matière Molle, ESPCI, Paris, France)



Polymer gels and networks are fascinating, versatile soft materials that are ubiquitous, from our daily life (foodstuffs, cosmetics, e.g.) to high-tech applications (tissue engineering, sensors, drug delivery e.g.). There are several types of polymeric networks. Among them, supramolecular polymer networks are three-dimensional structures of cross-linked macromolecules connected by transient, supramolecular bonds such as hydrogen bonding, transition metal complexation, $\pi - \pi$ stacking and interlocked interactions. They are soft materials, with huge potential for exhibiting properties such as self-healing, and shape-memory. The objective of this research PhD project is to study the dynamics of two different well-defined supramolecular networks and to understand their unique viscoelastic behavior. This requires determining the relationship between the composition and the viscoelastic properties of these materials, which could serve as a base to help to design a new class of smart materials with novel properties. In the first part of the thesis we study the dynamics of the well-defined slide-ring gels. In order to understand the influence of each component present in the slide-ring gels, we investigate the dynamics of the samples at each step of their preparation, from the polymer chain used for building the gels, to the polyrotaxane samples, which contain several rings along the chain backbone, and finally to the slide-ring gels, which are formed by cross-linking the rings of the polyrotaxanes. The controllable structure of these last ones allows us to understand the effect of structural parameters such as the influence of rings mobility, rings distance, or rings density on their dynamics. The second part is related to investigating and understanding the viscoelastic properties of properties of the metallo-supramolecular phase separated networks and determining how the structure and thermomechanical properties of these supramolecular networks are influenced by temperature, by the nature of the metal ions and by the amount of metal ions added into the system. In particular, we try to understand the relationship between the different morphologies of the sample and its viscoelastic properties, both properties depending on its thermal equilibration.