Controlling the Dynamics of Metallo-Supramolecular Polymer with Two Metal-Ligand Crosslinks

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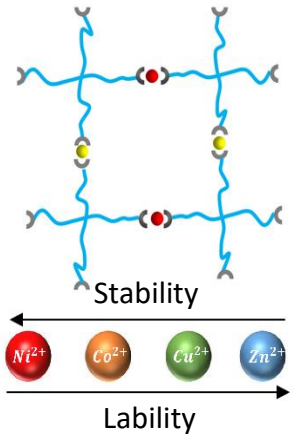
Introduction and Objective

Associating polymers[1], based on the reversible metal-ligand coordination, form a very promising and useful class of materials since the richness in their tailorable properties, from rubber to liquid-like properties, which has a huge potential of application such as biomedical engineering, coatings and adhesives. A large amount of research, both in melt state and solution state, have been conducted by means of varying the amount and nature of metal ions, ligand, building blocks, pH, temperature, and other external stimuli, to elucidate the dynamics of these materials. In the previous work in our group[2-3], the viscoelastic properties of linear and telechelic star poly(n-butyl acrylate)s end-capped with 2,2′:6′,2″-terpyridine at each chain extremity, able to self-associate by adding metal ions, have been investigated.

The dynamics of these materials are mainly governed by two synergistic processes, the association/dissociation events of the metal-ligand coordination and the dynamic of building blocks (entanglement). Herein, we would like to blend two metal ions within the material system and alter the concentration of these two types of metal-ligand crosslinks with distinct relaxation modes rather than by modifying the polymer itself, to control the viscoelastic properties of four-arm telechelic star poly(n-butyl acrylate)s. Therefore, the influence of the interaction of these two metal ions on the dynamics of obtained materials needs to be addressed and understood. To this aim, the material system was systematically investigated using small amplitude oscillatory shear and a modified tube-based time marching algorithm (TMA) model[4], respectively.



References

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