Linear and Nonlinear Viscoelastic Response of Metallo-Supramolecular Polymeric Networks

Christina Pyromali[1*], Flanco Zhuge[2], Charles-André Fustin[2], Evelyn van Ruymbeke[2] and Dimitris Vlassopoulos[1]

[1]FORTH, Institute of Electronic Structure & Laser and University of Crete, Department of Materials Science & Technology, Heraklion 71110, Crete, Greece

[2]FORTH, Institute of Electronic Structure & Laser and University of Crete, Department of Materials Science & Technology, Heraklion 71110, Crete, Greece

[2]Bio-and Soft Matter, Institute of Condensed Matter and Nanosciences, Université Catholique de Louvain, Croix du Sud 1, B-1348 Louvain-la-Neuve, Belgium

*e-mail: cpyromali@iesl.forth.gr

We present an extended experimental study of the linear and nonlinear shear viscoelastic properties of metallo-supramolecular transient polymeric assemblies with the aim to examine the structure and dynamics. Model dynamic networks functionalized with terpyridine ligands were formed by adding different metal ions. After cessation of simple shear flow, the stress relaxation of the network occurred via disentanglement and ligand exchange mechanism. Unbounded ligands and uncoordinated stickers play a significant role on the network stress relaxation. The influence of the latter was tailored by altering the temperature, the stoichiometric amount or the nature of metal ions. The stresses distribution within the network were found to depend on the value of shear rate and the strain. Through decoding the viscoelastic response as function of metal type and content, one can develop design criteria for tunable single and double networks.