Influence of Ligand for Metallo-Elastomer Design

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Primary CNF Tools Used: Rame-Hart 500 Goniometer

Abstract:

Metal-ligand coordination is an appealing strategy pursued to achieve crosslinking in the design of elastomers for biomedical applications. A variety of ligands, like catechols and imidazole groups, can be employed to achieve this and have been reported in literature. However, material property comparisons are usually done on a single ligand with variations in ligand density or complexation metal. Here, we intend to expand our understanding of ligand-metal coordination crosslinking in elastomer design via a head-to-head comparison of different ligands. We designed a modular polymer platform that allowed for easy conjugation with a Salen-, pyridoxal- or catechol based ligand. These polymers are used to evaluate the influence of the ligand on chelation strength, mechanical properties, catalytic activity and biological interaction.

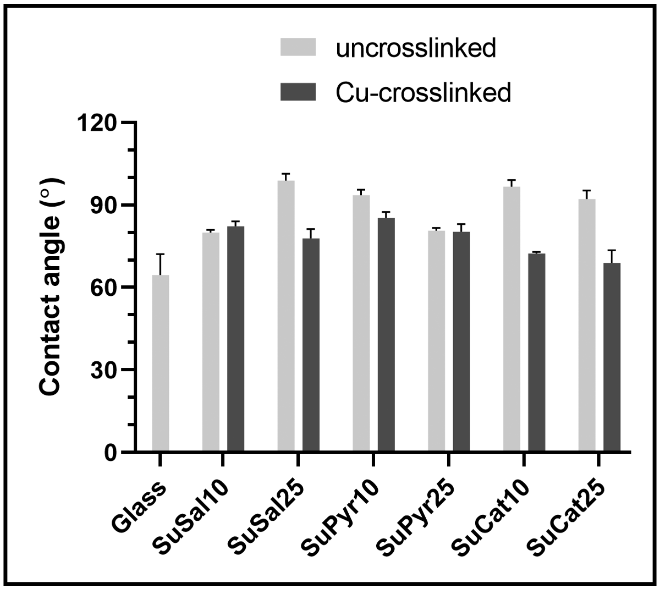

Figure 1: Plot of contact angles of water droplet on polymer surface for polymer only (= no Cu) and Cu-crosslinked polymer films.

Summary of Research:

The experimental work done in collaboration with CNF for this project is limited to contact angle measurements, using the Rame-Hart 500 Goniometer.

Thin films were prepared of polymer only or polymer crosslinked with Cu-salts on glass slides. The contact angle between a water droplet and the hydrophobic surface was analyzed. Overall, we observed a clear trend with a decrease in contact angle for films crosslinked with Cu compared to uncrosslinked films, indicating a more hydrophilic surface. We hypothesize that this is due to the crosslinking chemistry of these ligands that occurs via the formation of a phenolate anion that will chelate with the Cu-ion, the thereby generated ionic content increased hydrophilicity. This hypothesis is supported by the largest decrease for catechol (SuCat10 and SuCat25) based polymer due to deprotonation of both phenolic protons and higher anionic surface. An overview of the results is given in Figure 1 and 2.

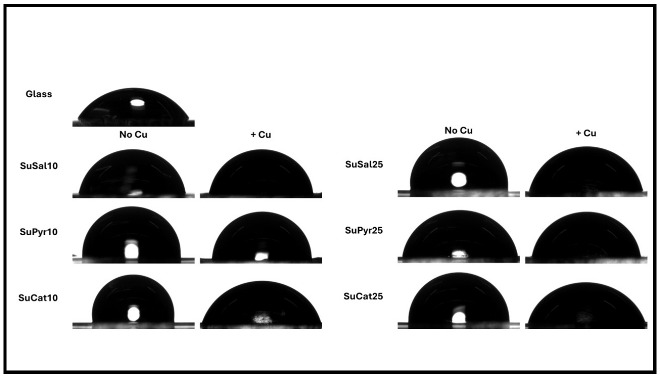

Figure 2: Visual presentation of change in contact angle upon Cu-crosslinking of films.