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Deconvolution of the role of metal and pH in metal coordinating polymers.[1] SETH CAZZELL, NIELS HOLTEN-ANDERSEN, Massachusetts Inst of Tech-MIT — Nature uses metal binding amino acids to engineer both mechanical properties and structural functionality. Some examples of this metal binding behavior can be found in both mussel foot protein and DNA binding protein. The mussel byssal thread contains reversible intermolecular protein-metal bonds, allowing it to withstand harsh intertidal environments. Zinc fingers form intramolecular protein-metal bonds to stabilize the tertiary structure of DNA binding proteins, allowing specific structural functionality. Inspired by both these metal-binding materials, we present mechanical and spectroscopic characterization of a model polymer system, designed to mimic this bonding. Through these studies, we are able to answer fundamental polymer physics questions, such as the role of pH and metal to ligand ratio, illuminating both the macroscopic and microscopic material behavior. These understandings further bio-inspired engineering techniques that are used to design viscoelastic soft materials.

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