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Bio-Inspired Metal-Coordination Dynamics: A Unique Tool for Engineering Soft Matter Mechanics

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Growing evidence supports a critical role of metal-coordination in soft biological material properties such as self-healing, underwater adhesion and autonomous wound plugging. Using bio-inspired metal-binding polymers, initial efforts to mimic these properties with metal-coordination crosslinked polymer materials have shown promise. In addition, with polymer network mechanics strongly coupled to coordinate crosslink dynamics material properties can be easily tuned from visco-elastic fluids to solids. Given their exploitation in desirable material applications in Nature, bio-inspired metal-coordinate complex crosslinking provides an opportunity to further advance synthetic polymer materials design. Early lessons from this pursuit are presented.