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Mussel-inspired reversible metal-coordinate bonds as a pathway towards temporal control over the mechanical hierarchy of soft materials SCOTT GRINDY, ROBERT LEARSCH, NIELS HOLTEN-ANDERSEN, Massachusetts Inst of Tech-MIT — Dynamic, reversible crosslinks have been shown to specifically control the mechanical properties of a wide variety of mechanically tough and resilient biomaterials. Here, we show that reversible histidine-metal ion interactions, long thought to contribute to the strong mechanical properties and self-healing nature of mussel byssal threads, can be used to control and engineer the hierarchical mechanical properties of model polyethylene glycol hydrogels orthogonally from the spatial structure of the material. We delve into the physics underlying these types of materials to properly understand how to explicitly engineer the mechanical properties of tough soft materials by utilizing their temporal hierarchy.

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