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The mussel thread cuticle, a biological granular composite coating NIELS HOLTEN-ANDERSEN, University of Chicago, Department of Chemistry, Chicago, IL 60637, USA, HENRIK BIRKEDAL, University of Aarhus, Department of Chemistry & iNANO, 8000 Aarhus C, Denmark, KAA YEE C. LEE, University of Chicago, James Franck Institute, Chicago, IL 60637, USA, J. HERBERT WAITE, University of California, Santa Barbara, Biomolecular Science & Engineering Program, Santa Barbara, CA 93106, USA — The cuticle of mussel byssal threads is a peculiar natural granular composite coating that combines high extensibility with high stiffness and hardness. In this study fluorescence microscopy and elemental analysis were exploited to show that the 3, 4-dihydroxyphenyl-L-alanine (dopa) residues of mussel foot protein-1 co-localize with Fe and Ca distributions in the cuticle of *Mytilus galloprovincials* mussel byssal threads. Removal of Fe and Ca from the cuticle by chelation results in a 50% reduction in hardness. Dopa-metal complexes may be a significant source of stability as cross-links in the composite cuticles.

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