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Electron transfer in coordination-based molecular assemblies

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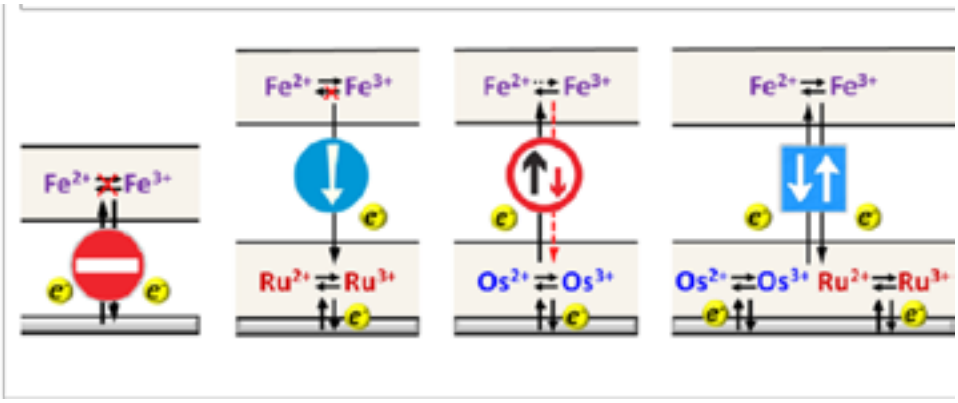
Directional electron-transfer events are the basis of many technologically important systems and biological processes. In this study, we demonstrate how the distance over which electron transfer occurs through organic materials can be controlled and extended. Coating of conductive surfaces with nanoscale layers of redox-active metal complexes allows the electrochemical addressing of additional but distant layers that are otherwise electrochemically silent. We also show that our composite materials can pass electrons selectively in directions that are determined by the positioning of redox-active metal complexes and the distances between them. These electron-transfer processes can be made dominantly uni- or bidirectional. Our design strategy involves: 1) a set of isostructurally well-defined metal complexes with different electron affinities, 2) a scalable metal-organic spacer, and 3) a versatile assembly approach that allows systematic variation of material composition, structure, and electron transfer properties. We control the electrochemical communication between interfaces by the deposition sequence of the components and the length of the spacer, and therefore we are able to program the bulk properties of the assemblies.



Biography

Milko E Van der Boom has completed his BSc in Chemical Engineering at the Amsterdam University of Applied Sciences and his MSc degree in Inorganic Chemistry from the University of Amsterdam. In 1994, he enrolled as a Doctoral student at the Weizmann Institute of Science, where he studied Organometallic Chemistry; he was awarded his PhD degree with distinction in 1999. After three years of Post-doctoral work at Northwestern University, where he studied the formation of Functional Organic Films, he returned as a Faculty Member to the Weizmann Institute's Department of Organic Chemistry. His interdisciplinary materials chemistry research focuses on metallo-organic oriented synthetic and mechanistic studies. His prizes and honors include an Alon Fellowship from the Israel Council for Higher Education, the Henri Gutwirth Prize from the Technion, and the Israel Chemistry Society's Prize for Excellent Young Chemists. He is the first incumbent of the Bruce A Pearlman Professional Chair.

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