European Journal of Inorganic Chemistry 2018 vol.2018 N28, pages 3344-3353

Electron Transfer and Unusual Chemical Transformations of F4-TCNQ in a Reaction with Mn-Phthalocyanine

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Abstract

© 2018 WILEY-VCH Verlag GmbH & Co. KGaA, Weinheim The interaction of manganese phthalocyanine with F4-TCNQ is accompanied by the transformation of the acceptor molecule into a new organic ligand, the 4-(dicyanomethanido)tetra-fluorobenzoate dianion, resulting in the formation of a unique MnIII charge-transfer complex, in which two Mn phthalocyanine moieties are bridged by the dianion, with parallel arrangement of all aromatic fragments and an interplanar distance of 3.30 Å. The formation of the complex takes place in a 2:1 ratio, with the two electrons transferring from two donor molecules to an acceptor molecule. Magnetic measurements reveal that MnIII ions in the studied complex occur in the high-spin state S = 2 and are coupled antiferromagnetically, presumably by the superexchange mechanism through the 4-(dicyanomethanido)tetrafluorobenzoate dianion bridge, with an interaction constant of J = 5 cm–1 (7 K). According to the electrochemical data, the new complex appears to have unusual redox properties and might be described as an electronic reservoir with strong acceptor ability, being able to take seven electrons. Notably, all of the reduction–oxidation steps are reversible, proceeding without structural changes.

http://dx.doi.org/10.1002/ejic.201800641

Keywords

Electron transfer, Fluorinated ligands, Manganese, Phthalocyanines

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