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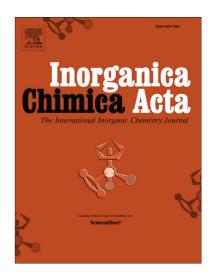
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ACCEPTED MANUSCRIPT

Electrocatalytic Hydrogen Evolution Reaction with a Supramolecular

Cobalt(II)phthalocyanine Carrying Four Cobaloxime Moieties

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Abstract

A supramolecular cobalt phthalocyanine (CoPc) bearing four redox active cobaloxime

(CoDMG) substituents ((CoDMG)₄-CoPc) was synthesized and electrochemically

characterized in order to determine its functionalities for practical usages as effective

electrocatalysts. Voltammetric analyses of CoDMG, CoPc, and (CoDMG)4-CoPc indicated

redox activity of each compounds and supported substitution of *CoPc* with *CoDMG*.

(CoDMG)₄-CoPc showed three CoPc based reduction processes and two CoDMG based

reduction processes. While *CoDMG* showed two reduction and one oxidation processes.

CoPc illustrated three reduction and two oxidation processes. Binding of *CoDMG* to *CoPc*

increased the reduction processes to five. Multi-electron and metal and/or ring based redox

processes showed worthy of the (CoDMG)₄-CoPc for using as an electrocatalyst. Shifting of

the proton reduction reaction toward the positive potentials indicated electrocatalytic activities

of the complexes for the hydrogen evolution reaction (HER). Among CoDMG, CoPc, and

(CoDMG)₄-CoPc, modified glassy carbon electrode with (CoDMG)₄-CoPc illustrated the

highest electrocatalytic activity and it decreased the over-potential of the bare electrode about

360 mV and increased the current density of the electrode about 10 fold.

Keywords: Supramolecule, Electrocatalyst, Hydrogen evolution reaction, Phthalocyanine

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