Schulich Faculty of Chemistry
Technion – Israel Institute of Technology

Grand Technion Energy Program
תכנית האנרגיה ע"ש גרנד

הפקולטה לכימיה ע"ש שוליך
הטכניון - מכון טכנולוגי לישראל

סמינר כימיה אורגנית ואי אורגנית

יום א' 06.01.2019 שעה 09:30

Lee Engelberg

Schulich Faculty of Chemistry and
Grand Technion Energy Program, Technion

נושא:

PEPTOID-CO(II) COMPLEXES AS WATER OXIDATION ELECTROCATALYSTS

This research was conducted under the supervision of Assistant Prof. Galia Maayan

ההרצאה תתקיים בחדר הסמינרים הפקולטי

chfruma@techunix.technion.ac.il
www.schulich.technion.ac.il
T. + 972 4 829 3654
F. + 972 4 829 3499
Technion City
Haifa 32000 Israel
קרית הטכניון
חיפה 32000

Peptoid-Co(II) Complexes as Water Oxidation Electrocatalysts

Abstract:

During past years, many efforts have been made to develop renewable and sustainable energy generation methods and eliminate the need for carbon-based energy. Hydrogen based fuels are produced from water-splitting, and are considered to be efficient, reliable and sustainable. The most challenging part of water splitting is the water oxidation reaction, as it transfers 4 electrons. A water-oxidation catalyst (WOC) is needed for this reaction to be rapid and efficient.

Many WOCs based on precious-metals have been reported, but WOCs based on earth-abundant non-precious metals have higher economical potential and applicability. Cobalt catalysts are of high interest, as cobalt is abundant and cheap, and moreover, has easily changeable oxidation states, therefore can be used as a catalyst in redox processes.

Our approach for developing a WOC is biomimetic, employing N-substituted glycine oligomers, which are peptide mimics named "peptoids". Their efficient synthesis employs primary amines, enabling the incorporation of metal binding side chains, with a rationally designed specific sequence. Thus, peptoid-metal complexes can be obtained and used for catalysis.

In this study, different trimeric peptoid-cobalt complexes were synthesized, characterized and their electrocatalytic activity was investigated. These complexes were found to be active in neutral pH and exhibit a fairly low overpotential towards water oxidation in phosphate buffer. Moreover, by altering one ligand of the peptoid, the catalytic properties are changed from heterogenous to homogenous catalysis, indicating the significance of an oxidatively-stable ligand sphere to the reactivity of the catalyst, and the significance of rational design of molecular catalysts.

chfruma@techunix.technion.ac.il
www.schulich.technion.ac.il
T. + 972 4 829 3654
F. + 972 4 829 3499
Technion City
Haifa 32000 Israel
קרית הטכניון
חיפה 32000