**Photocatalytic and Electrocatalytic Reduction of CO2 to CO by Polypyridyl Complexes**

***Hassan Hadadzadeh, Professor of Inorganic Chemistry, Department of Chemistry,***

***Isfahan University of Technology, Isfahan84156-83111, Iran, E-mail address: hadad@cc.iut.ac.ir***

Greenhouse gases (GHGs) increase the Earth's atmosphere temperature and according to the Kyoto Protocol, the industrialized countries promised to reduce their levels of emission of the GHGs, especially CO2. In the Earth's atmosphere, CO2 is removed and return according to the carbon cycle. Unfortunately, this natural carbon cycle is disturbed by human interference. Many researchers have focused on the conversion and utilization of CO2 for the production of useful chemicals and fuels. CO2 is the most thermodynamically stable oxide of carbon at room temperature and breaking its carbon-oxygen double bonds (C═O) requires a lot of energy. In spite of this fact, there are four different methods for CO2 splitting, *viz*. enzymatic, electrocatalytic reduction, photocatalytic reduction and abstraction of an oxygen atom from a CO2 molecule. Carbon dioxide can be reduced to CO by electrochemical method using pure metals, alloys, metal coordination complexes or organometallic catalysts at room temperature. Photochemical conversion of CO2 to fuels or valuable chemicals using renewable solar energy is also an interesting solution to both the world’s demand for fuels and decrease of greenhouse gas emissions.

In recent years, polypyridyl complexes have proven to be active in photocatalytic and electrocatalytic reduction of CO2 to different fuels and chemicals. In this presentation, I review our recent studies of the photocatalytic and electrocatalytic reduction of CO2 to Co by polypyridyl Ru(II) and Re(I) complexes.

**References:**

1. H. Hadadzadeh et al., Computational and experimental study on the electrocatalytic

reduction of CO2 to CO by a new mononuclear ruthenium(II) complex, ***Dalton Transactions***, **2014**, 43, pp. 11317-11332.

1. H. Hadadzadeh et al., Photocatalytic reduction of CO2 to CO by a dinuclear carbonyl

 polypyridyl rhenium(I) complex, ***Polyhedron***, **2014**, 78, pp. 112-122.