SYNTHESIS OF TRANSITION METAL MACROCYCLIC COMPLEXES FOR THE UTILIZATION OF CO_2

W.D.T.J. Nawarathne

Postgraduate Institute of Science , University of Peradeniya , Peradeniya , Sri Lanka.

and

Department of Chemistry, University of Peradeniya , Peradeniya , Sri Lanka.

Macrocyclic metal complexes are very stable species and they have unusual electronic and electrochemical properties. Therefore they have numerous applications. Recently, much attention has been paid to electrocatalytic reduction of small hazardous gas molecules such as CO_2 by macrocyclic complexes. Therefore the major concern of this research project was to synthesize transition metal macrocyclic complexes capable of the utilization of CO_2. In this research project Ni(II)TMTAA and Cu(II)TMTAA complexes were synthesized by template synthesis method and characterized by Cyclic voltammetric, XRD, XRF, H-NMR , FTIR and UV-visible spectroscopic techniques. The CO_2 Trapping capabilities of these complexes were studied by a VenireLabPro CO_2 Gas Sensor.

The UV-Visible spectroscopic data of Ni(II)TMTAA complex shows interesting acid base properties and anion(SCN^-, HCO_3^-, Br^- and I^-) binding capabilities. It has absorbed approximately 20% more CO_2 than its starting material, nickel acetate. The synthesized dark green Cu(II)TMTAA complex shows reversible acid base properties unlike Ni(II)TMTAA complex. This complex shows HCO_3^- trapping capabilities and approximately 30% more CO_2 absorbance capacity than its starting material, copper acetate. The cyclic voltametric (CV) data reveals that both complexes have electrocatalytic reduction of CO_2.