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Conversion of Chlorophyll into an Iron (II) Complex similar to Hemoglobin and investigation of its Carbon dioxide trapping capacity

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A novel green coloured Fe(II) macrocyclic complex synthesized by treating a chlorophyll extraction of a *Titonia* species with Fe(III) salt, 1-methyl-2-pyrrolydinone and reducing with Zn/Hg shows a remarkable CO_2 binding capacity. Cyclic Voltametric (CV), UV-Visible and H^1NMR spectroscopic techniques were used to characterize the complex. CO_2 trapping was monitored with a Vernier CO_2 Gas Sensor, which measures gaseous carbon dioxide levels by monitoring the amount of infrared radiation absorbed by carbon dioxide molecules. The UV-Visible spectrum of the complex shows a d-d band at ~408 nm indicating a significant higher LFSE for the complex. A band at ~ 650 nm, which is common to Fe(II) / Fe(III) complexes and chlorophyll, reflects the intraligand electronic transition of prophyrin ring. There is a significant difference in the electrode potentials of Fe(III) and Fe(II) complexes. The electrode potential of Fe(II) complex shifts to a higher value than the relevant Fe(III) analogue indicating relatively higher stability (Lower or *–ve* ΔG) for the Fe(II) complex. The most interesting feature is that the novel iron (II) macrocyclic complex shows a significant higher capacity for CO_2 utilization than the chlorophyll *a* and simple Fe(II)/(III) salts (Fig.1, Fig.2, Fig.3).

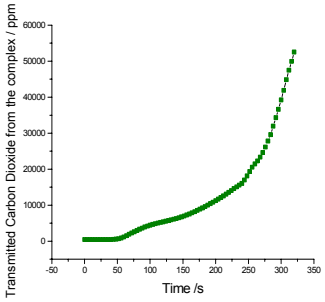

Fig.1: CO_2 transmittance from Fe(II) complex with time

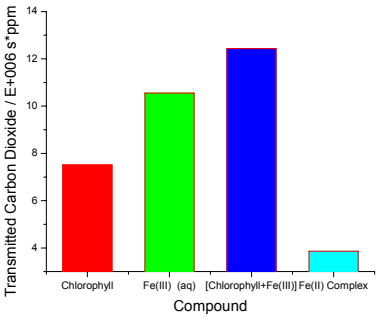

Fig.2: CO_2 transmittance for complexes

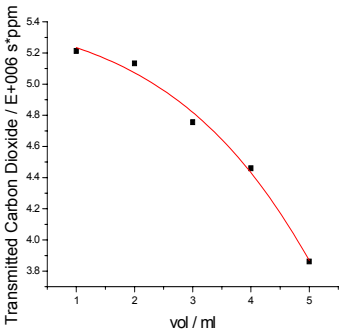

Fig.3: CO_2 transmittance with increasing Fe(II) complex

Keywords: Fe(II) macrocyclic complex, porphyrin, Chlorophyll *a*, small molecule activation, Carbon dioxide utilization.