

## MUREP Small Business Technology Transfer (M-STTR) Planning Grants

**Title:** Carbon Dioxide Electrolysis via Electrochemical Reactions in Polymerized Ionic Liquid (POIL) Membranes for Oxygen Resource Recovery

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**City/State:** El Paso, Texas

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### **SUMMARY:**

In this research we explore the electrochemical conversion of carbon dioxide to oxygen and CO in a polymerized ionic liquid membrane electrode assembly (POIL-MEA). Ionic liquids are salts, consisting of ions, with melting points lower than 0 °C. One of the main advantages of ionic liquids is their high capacity to solubilize a wide range of compounds. Previous investigations suggest that ionic liquids are highly adsorptive against CO<sub>2</sub> and are also able to decrease the reduction potential for CO<sub>2</sub> by *c.a.* 0.65 V due to the capacity of IL's to form an intermediate with a lower energy state than CO<sub>2</sub> occurring according to scheme in Figure 2.8-9 This accomplishment is of utmost importance because CO<sub>2</sub> reduction overpotential has been the subject of major efforts to make this reaction feasible. The reaction of CO<sub>2</sub> electrolysis produces CO, which can be later treated via hydrogenation or Boudard reactions since the main objective of the proposed application is to recover oxygen. As later explained the reduction of CO to other valuables will be evaluated during phase II using a similar strategy to the here proposed in a TANDEM mode. One can observe that in the scheme hydrogen ions are consumed, however as we will see latter in the proposed approach non-water, non-solvent strategy is employed in order to produce oxygen anions instead.