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Electrochemical carbon dioxide conversion system

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Statement of the Problem: Growing carbon dioxide (CO_2) emission through human activities using fossil fuels has been great concern all over the world. CO_2 emissions from existing infrastructures can be efficiently suppressed with carbon capture and sequestration, but it is not permanent solution. Rather, conversion of CO_2 into some useful chemicals would be the better way for CO_2 mitigation. Electrochemical conversion of CO_2 has been identified as a viable technique that could recycle the CO_2 to reduced forms and store it in the form of chemical bond energy. The technology is highly desirable as it generates carbon neutral fuels for portable applications which could replace those driven by fossil fuels maintaining an environmental stability. Previous researches have shown the discovery of co-catalyst systems with different noble metals such as Ag and ionic liquids such as EMIM-BF4, which have opened up several avenues for electrochemical reduction of CO_2.

Methodology & Theoretical Orientation: An electrochemical flow cell having a fuel-cell like structure has been designed and fabricated for electrochemical reduction of CO_2. MoS_2, one of common Transition Metal Dichalcogenides (TMDCs) materials, inexpensive and earth-abundant element was employed as electro-catalysts along with ionic liquid (EMIM-BF4) for conversion of CO_2 into energy rich intermediates. The flow passage was carved on graphite plates and the catalyst was directly doped on the passage. The total active area was 10 cm_2 for the catalyst to interact with the electrolyte and gas molecules.

Findings: The data extracted from the Gas Chromatography (GC) clearly showed carbon monoxide and hydrogen being produced as major products that permit the formation of synthetic gas (H_2+CO) and consequently be utilized for other development processes.

Conclusion & Significance: This technology could convert CO_2 in a fast, energy and cost effective way which could open doors for CO_2 conversion in ambient conditions.

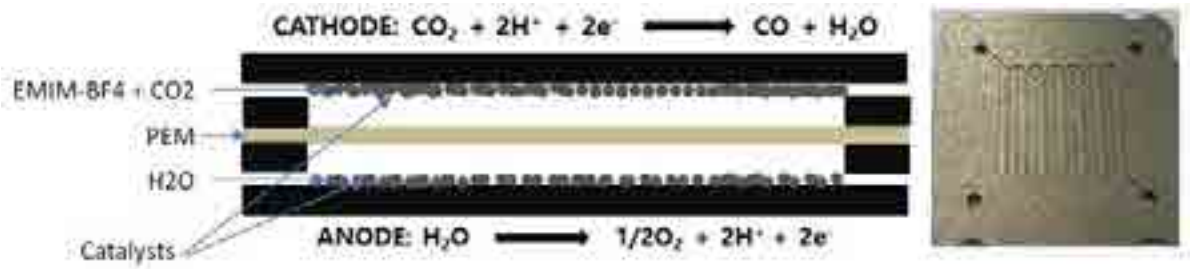

Figure 1: Schematic diagram of the integrated CO2 reduction flow cell system

Biography

Md Obaidullah has completed his BS in International University of Business Agriculture and Technology and he currently doing research regarding electrochemical CO_2 conversion.

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