

TURNING CARBON DIOXIDE INTO USEFUL CHEMICALS

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ABSTRACT (maximum 300 words)

Carbon dioxide (CO₂) is a greenhouse gas, mainly caused by the excessive burning of fossil fuels. This increase in CO₂ generation at a fast rate probably introduces an irreversible change to the world's climate. The first recognition of the negative impact of CO₂ can be traced back to 1870s, when European scientists reported that carbonic acid, a by-product of rapidly expanded industrialization, contributed to acid rain and artificial warming. However, the utilization of CO₂ as a carbon source is challenging due to the high thermal and chemical stability of CO₂ molecules and its high endothermicity of cleavage of its C-O bond. There are many different methodologies have been studied in conversion of CO₂ to chemicals including photocatalysis, electrochemical approaches. Non-thermal plasma, NTP (or sometime referred to as cold plasma), contains electrons, neutrals, electronically and vibrationally excited species, ions, radicals, and atoms. The collision of these charged species with chemicals can catalyze the reactions such as bond dissociation or formation to take place at low temperatures and milder conditions than currently commercialized chemical processes. However, the final resulted chemicals are complex, and the selectivity is low. This work aims to introduce catalysts to the NTP system to promote the selectivity of desired product(s). The rationale of catalyst design, selection of reaction condition and reactor design will be investigated. One example, conversion of CO₂ to ethanol, will be demonstrated in the presentation.

Keywords: *Carbon dioxide, catalysis, thermal, Cold Plasma,*