

A Cylindrical Microwave Plasma Reactor Simulation Using COMSOL Multiphysics for CO2 Dissociation in Pure and Gas Mixture Streams

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[Aliaa H. Abbas](#) ; [Wasan A. Wali](#) [All Authors](#)

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Abstract

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Abstract:
Discussing the impact of carbon dioxide on the environment and whether it is beneficial or harmful depends on its source. Human activity sources have led to excessive release of carbon dioxide, contributing to global warming, climate change and health issues. The use of non-thermal plasma can convert carbon dioxide into a useful fuel through the production of synthetic natural gas (syngas). Synthetic gas is a mixture of hydrogen and carbon monoxide. This paper presents a simulation of a cylindrical microwave plasma based on COMSOL Multiphysics software to produce carbon monoxide (CO) from the dissociation of carbon dioxide through pure and gaseous mixture streams. Most the studies simulated a two-dimensional model with different shapes. In this research, a three-dimensional simulation of a cylindrical reactor will be presented as the powerful way to visualize objects and environments realistically. The simulation covers a range of scenarios, including high carbon dioxide concentrations, the introduction of argon gas, and coupling with other ionization and surface reactions.

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