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The influence of reactor walls surface conductivity on carbon dioxide discharge properties in DBD IGOR BELOV, SABINE PAULUSSEN, VITO, Sustainable Materials Management, Mol, Belgium, ANNEMIE BOGAERTS, University of Antwerp, PLASMANT, Antwerp, Belgium — This work examines the properties of a dielectric barrier discharge (DBD) reactor, build for CO_2 decomposition, by means of electrical characterization, optical emission spectroscopy and gas chromatography. Several features of electric waveforms specific for CO_2 discharges in the DBD systems were observed (asymmetry, high-current sparse peaks). Current waveforms revealed the difference in the microdischarge development of the positive and the negative half-cycles of the applied voltage. It was found that the discharge current is highly promoted in configurations (i.e. in certain half-cycles) with a conductive cathode. The transition from an asymmetric current waveform to a symmetric one was investigated during tests on CO_2 decomposition and subsequent conductive carbon film deposition on the reactor walls. The double dielectric (DD) and metal-dielectric (MD) configurations were compared in terms of discharge properties and conversion efficiency. The same effect of discharge current enhancement was observed when a conductive film was deposited on the outer dielectric in the DD configuration. Consequently, also conversion efficiency was found to increase. In addition, optical emission spectroscopy confirmed the strong correlation of plasma reactivity with the presence of a conductive coating on one of the electrodes. This way it is possible to control the process efficiency and modify the microdischarge activity in the DD reactor without using elaborated dielectric materials.

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