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CO_2 Dissociation by Low Current Gliding Discharge in the Reverse Vortex Flow ALEXANDER GUTSOL, Chevron Energy Technology Company — If performed with high energy efficiency, plasma-chemical dissociation of carbon dioxide can be a way of converting and storing energy when there is an excess of electric energy, for example generated by solar elements of wind turbines. CO_2 dissociation with efficiency of up to 90% was reported earlier for low pressure microwave discharge in supersonic flow. A new plasma-chemical system uses a low current gliding discharge in the reverse vortex flow of plasma gas. The system is a development of the Gliding Arc in Tornado reactor. The system was used to study dissociation of CO_2 in wide ranges of the following experimental parameters: reactor pressure (15-150 kPa), discharge current (50-500 mA), gas flow rate (3-30 liters per minute), and electrode gap length (1-10 cm). Additionally, the effect of thermal energy recuperation on CO_2 dissociation efficiency was tested. Plasma chemical efficiency of CO_2 dissociation is very low (about 3%) in a short discharge at low pressures (about 15 kPa) when it is defined by electronic excitation. The highest efficiency (above 40%) was reached at pressures 50-70 kPa in a long discharge with thermal energy recuperation. It means that the process is controlled by thermal dissociation with subsequent effective quenching. Plasma chemical efficiency was determined from the data of chromatographic analysis and oscilloscope electric power integration, and also was checked calorimetrically by the thermal balance of the system.

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