Abstract Submitted
for the GEC19 Meeting of
The American Physical Society

Microwave plasma reactor for CO_2 decomposition STEFAN MERLI, IRINA KISTNER, IGVP, University of Stuttgart, FREDERIC BUCK, THOMAS SCHIESTEL, Fraunhofer IGB, ANDREAS SCHULZ, MATTHIAS WALKER, GNTER TOVAR, IGVP, University of Stuttgart — Since electricity from renewable sources of energy is subject to fluctuations, energy storage plays a crucial role to create a reliable grid system. The CO_2 conversion into syngas or higher hydrocarbons via a plasma assisted gas conversion powered by renewable energy is a promising approach towards energy storage. To make this power to gas concept applicable it is important to improve its energy and conversion efficiency. Therefore, a modular microwave plasma unit for CO_2 conversion has been set up and investigated. This plasma torch enables a self-ignition and stable operation of the CO_2 plasma over a wide range of parameters. The electric field distribution and the gas flow inside the plasma torch were modeled with an FEM simulation to optimize the configuration. Another important point is the separation of oxygen from the CO_2 plasma to obtain pure CO for the syngas. For this purpose a tubular reactor was constructed, which is connected to the plasma torch and that contains a ceramic capillary, which acts as a permeation membrane for the oxygen. The oxygen permeation was investigated for a variety of capillary material compositions to identify the best operating conditions for the conversion of CO_2.

Stefan Merli
IGVP, University of Stuttgart

Date submitted: 03 Jun 2019 Electronic form version 1.4