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CO_2 dissociation in vortex-stabilised microwave plasmas S. WELZEL[1], W.A. BONGERS, M.F. GRASWINCKEL, M.C.M. VAN DE SANDEN[2], FOM Institute DIFFER, Edisonbaan 14, 3439 MN Nieuwegein —
Plasma-assisted gas conversion techniques are widely considered as efficient building blocks in a future energy infrastructure which will be based on intermittent, renewable electricity sources. CO_2 dissociation in high-frequency plasmas is of particular interest in carbon capture and utilisation process chains for the production of CO_2-neutral fuels. In order to achieve efficient plasma processes of high throughput specifically designed gas flow and power injection regimes are required. In this contribution vortex-stabilised microwave plasmas in undiluted CO_2 were studied in a pressure range from 170 to 1000 mbar at up to 1 kW (forward) injected power, respectively. The CO_2 depletion was measured downstream, e.g. by means of mass spectrometry. Although the system configuration was entirely not optimised, energy efficiencies of nearly 40%, i.e. close to the thermal dissociation limit, and conversion efficiencies of up to 23% were achieved. Additionally, spatially-resolved emission spectroscopy was applied to map the axial and radial distribution of excited atomic (C, O) and molecular (CO, C_2) species along with their rotational temperatures.

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