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Conversion of CO2 to CO using radio-frequency atmospheric pressure plasmas ALEXANDER FOOTE, JAMES DEDRICK, DEBORAH O'CONNELL, MICHAEL NORTH, TIMO GANS, University of York — Low temperature plasmas can be used for the in situ generation of CO, from relatively non-toxic CO_2. CO is very useful in many industrial chemical processes and so, via low temperature plasmas, CO_2, a waste product, can be converted into a valuable chemical. The key challenges in using this method, for CO production, are optimising the energy efficiency, maximising the conversion of CO_2 into CO and then separating the CO from the other species produced in the plasma. Very high yields of CO, greater than 90%, have been achieved at atmospheric pressure using argon as a carrier gas with admixtures up to 1.5% with energy efficiencies of up to 4%. The plasma generated in continuous and spatially homogeneous and is driven at a frequency of 40.68 MHz. A zero dimensional global model has also been used to simulate the chemical kinetics of the plasma to determine the dominant dissociation processes and is in good agreement with the experimentally determined yields. The model is used to determine how important a role the vibrational states of CO_2 are, in a highly collisional plasma, to the production of CO and there can provide insight into how to improve the energy efficiency and suppress unwanted reactions.

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