Plenary Talk PV II Mon 9:45 ELP 6: HS 3+4

The role of plasma conversion technology in the greening of the chemical industry — •Richard van de Sanden — Dutch Institute for Fundamental Energy Research (DIFFER), P.O. Box 6336, 5600 HH, Eindhoven, The Netherlands — Eindhoven Institute for Renewable Energy Systems (EIRES), Eindhoven University of Technology, The Netherlands

The worldwide climate crisis has greatly driven the current deployment of sustainable energy sources, such as wind and solar to lower CO2 emissions. A next grand challenge is to develop effective and economical chemical conversion processes for green chemicals and fuels.

In this talk, after an introduction to the challenges facing the world in the next decades, I will discuss the opportunities of using plasmas, powered by renewable electricity, for scalable gas conversion of key molecules such as CO2 and N2. In particular I will address the use of microwave plasma to dissociate CO2 into CO and O2, and the formation of NOx from air and the possible, often claimed, role of nonequilibrium vibrational kinetics. A scheme to possibly exploit vibrational stimulation of chemical reactions by plasma, I will present a unique hybrid type reactor consisting of a plasma reactor and solid state water electrolysers with oxygen ion or proton conducting membranes. One aided benefit of this proposed approach is that both technologies, i.e. water electrolyser and plasma activation, utilize base molecules (N2 and H2O) and can be directly powered by renewable electricity. Such a scheme may be a stepping stone to zero carbon footprint processes.