

Recent trends in renewable energy driven chemistry for energy conversion and storage: plasma chemistry as the special case

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In a circular CO₂ neutral society, where the use of dense energy carriers based on carbon will still be needed, the re-use of (air captured) carbon dioxide is required. These dense energy carriers can be utilized to mitigate intermittency of renewable energy sources by providing seasonal storage, as feedstock for the chemical industry to replace fossil based feedstock and as green fuels for long haul and air transport. The use of electrons, from renewable electricity, or photons, directly from the sun, provide scientific and technological opportunities to develop novel pathways for chemical conversion. 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 possible role of nonequilibrium vibrational kinetics.