



Tutorial #4

Electricity driven chemical conversion; the role plasma technology can play

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After a general introduction on the challenges of the energy transition, I will give an overview of the status of chemical conversion processes by means of plasma-assisted (non-thermal) processes. I will address the question where plasma have a meaningful role to play in the electrification of chemical conversion processes. In particular I will focus on the cases of non-thermal plasma conversion of CO₂, N₂/O₂ and CH₄ (plasma pyrolysis or dry reforming with CO₂) using microwave generated plasmas.

The renewable energy driven chemistry in which the non-thermal properties of plasma (difference in temperatures between the electrons, the molecules and their vibrational degrees of freedom), possibly with the assistance of catalysts, can drive chemical conversions beyond the thermal limit. Important aspects as energy and conversion efficiency and the underlying non-thermal chemistry and kinetics at play, as determined using several (in situ) diagnostics, will be highlighted. In addition, some novel approaches in which plasma is combined with electrochemical conversion using hydrogen or oxygen transporting membranes and their potential advantages, will be discussed.