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HYDROGEN PRODUCTION VIA THERMAL PLASMA

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The majority of hydrogen (98%) is produced from the reforming of fossil fuels (mostly methane). Here we want to briefly introduce the possibilities of employing thermal plasma processes to produce hydrogen. Plasma is generated when gaseous molecules are forced into high energy collisions with charged electrons, resulting in the generation of charged particles. The energy required to create plasma can be thermal or carried by either an electric current of electromagnetic radiations. Intermittent renewable sources of electricity can be advantageously used to avoid indirect CO_2 (and other) emissions to be produced by needed electricity generation.

Cracking: The principle of this plasma process allows a simultaneous synthesis of hydrogen and solid carbon by directly splitting natural gas, thanks to an external electric energy source. This possibility of hydrogen production is thermodynamically less costly than steam reforming with 37.8 kJ versus 63 kJ per Hz_2 mole respectively. When compared to water electrolysis, direct methane decarbonisation is ideally eight times less costly.

Plasma treatment of waste materials: Thermal plasma offers specific performance characteristics. Heat supplied by plasma is used for melting and vitrification of inorganic materials and gasification of organic substances. Thermal plasma enables the decomposition of organic materials by pure pyrolysis in the absence of oxygen, or by gasification with a sub-stoichiometric amount of added oxygen (free O_2 or in the form of H_2O or CO_2). Within our contribution, we will describe our results and plans of studying the possibilities of the technologies mentioned above and their experimental testing on the scale of 150 kW within our experimental plasma reactor PLASGAS.

Biography

Michal Jeremias has completed his PhD from University of Chemistry and Technology in Prague and Postdoctoral studies from Cranfield University (UK), Combustion and CCS Centre. He is the Head of department of Plasma Chemical Technologies at the Institute of Plasma Physics of the Czech Academy of Sciences. He has published more than 25 papers in reputed journals on the themes of waste and biomass gasification and pyrolysis, catalytic processes in fluidised beds and CO2 capture via calcium looping.

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