Workshop »Coatings for Energy Technologies«

High Power Plasmas enabling the Electrification of Industrial Processes

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Progressing climate change and the Russian invasion of Ukraine is pushing especially Europe towards accelerating it´s energy transformation towards renewable energy sources. As a result, primary energy will gradually shift towards electric power, subsequentially increasing the need to electrify industrial processes, as well.

The fossil-to-electric (F2E) transformation potential of Europe´s industrial sectors is estimated to accumulate to approx. 800TWh/a, (Figure 1).

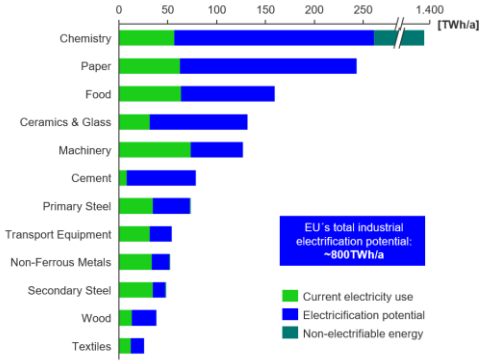

Figure 1: Europe´s industrial sectors´ electrify-cation potential; transcript from [1] by the curtesy of S. Madeddu.

This talk will discuss different electrification options and the related power electronic supply requirements. A focus will be set on high power plasma torches for esp. retrofitting existing gas- and oil-burners in different industries, like for instance in the metal, cement, or glass industry.

Depending on the specific to-be-electrified industrial process different plasma types can be utilized (Figure 2). And each plasma type requires dedicated power generators operating at specific voltages, power levels and esp. output frequencies to ignite and maintain the plasma. This talk will high-light one application example and the related boundary conditions.

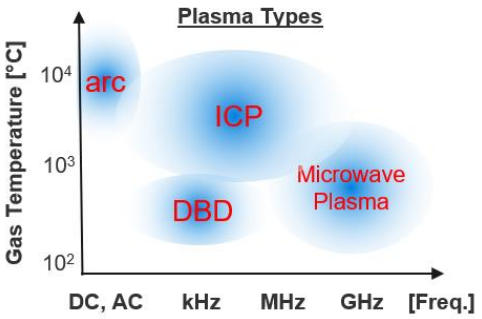

Figure 2: Different plasma types like DC-/AC-arc, MF- or RF- inductively coupled plasmas (ICP), dielectric barrier discharge (DBD) or for instance microwave plasma can be utilized. Each of these plasma types has advantages and disadvantages that need to be matched to the specific to-be-electrified industrial process.

References:

1. Silvia Madeddu Falko Ueckerdt, Michaja Pehl, Jürgen Peterseim, Michael Lord, Karthik Ajith Kumar, Christoph Krüger and Gunnar Luderer (2020) The CO2 reduction potential for the European industry via direct electrification of heat supply (power-to-heat), Environ. Res. Lett. 15 (2020) 124004