SYPP 2: Pulsed Power II: Anwendungen

Time: Tuesday 14:00–16:00 Location: V57.03

Invited Talk SYPP 2.1 Tue 14:00 V57.03

Generation of pulsed magnetic fields – stretching the limits — •Joachim Wosnitza — Hochfeld-Magnetlabor Dresden, Helmholtz-Zentrum Dresden-Rossendorf, Germany

High magnetic fields are one of the most powerful tools available to scientists for the study, modification, and control of the state of matter. The application of magnetic fields, therefore, has become a commonly used instrument in condensed-matter physics. Consequently, the demand for ever higher magnetic-field strengths is increasing. At the Dresden High Magnetic Field Laboratory (Hochfeld-Magnetlabor Dresden, HLD), pulsed magnetic fields up to about 90 T are readily available for users. For the generation of such high pulsed magnetic fields a specially designed world-unique capacitor bank has been installed. Operating at a maximum voltage of 24 kV, peak currents of up to 500 kA with a pulsed power of about 5 GW can be supplied. Besides this high-energy (50 MJ) capacitor bank, a number of smaller capacitive pulsed-power generators are designed at the HLD, some of which supply currents beyond 1.5 MA on a microsecond time scale.

Invited Talk SYPP 2.2 Tue 14:30 V57.03

Stand der Technik und Entwicklungen für Pulsed Power Module in Medizinischen Excimerlaser — •Claus Strowitzki[1] und Matthias Dahlke[2] — [1]MLase AG, Industriestr. 17, 82110 Germering — [2]MLase AG, Industriestr. 17, 82110 Germering

Die Pulsed Power Module zum Pumpen von Excimerlaser sind komplexe Systeme, die für die Leistungsfähigkeit des Lasers entscheidend sind. Seit ca. 10 Jahren haben halbleiterbasierte Systeme Thyratrons fast vollständig verdrängt. Neuer Entwicklungen zielen darauf ab das Netzteil in das Pulsed Power Modul zu integrieren. Damit einher geht eine intelligente Steuerung der Funktion.

Invited Talk SYPP 2.3 Tue 15:00 V57.03

Pulsed Power Applications at Karlsruhe Institute of Technology — •Georg Mueller — Karlsruhe Institute of Technology (KIT), Institute for Pulsed Power and Microwave Technology (IHM),76344 Eggenstein-Leopoldshafen, Germany

In this paper we review the progress that has been achieved at Karlsruhe Institute of Technology (KIT) for several industrial scale projects and in basic investigations based on intense particle beams and pulsed power technologies. Using intense large area pulsed electron beams thin layers at the surface of materials can be heated adiabatically above the melting point and through rapid cooling restructure or alloy the surface to improve corrosion or wear resistance properties. This technique was applied to solve the corrosion problems of future heavy liquid metal (Pb, PbBi) cooled nuclear power plants. Substantial progress has also been made in the development and optimisation of electrodynamic fragmentation facilities. Using adequate high current switch electrode materials, low loss capacitors and optimised component arrangements for minimum energy loss, service intervals of the high repetition rate pulse generators used in such facilities could be extended to beyond one year. Electrodynamic fragmentation facilities are now marketed by our Swiss industry partner, in particular in the fields of mineral exploration and processing. Pulsed electric fields of microsecond duration with electric field strengths of few to tenth of kV/cm can induce pores in the membrane of biological cells. This effect is used to extract foodstuff from plant cells, to accelerate the drying of biomass for energetic use or to reduce bacterial contamination in waste water.

Invited Talk SYPP 2.4 Tue 15:30 V57.03

Pulsed Electric Fields in Food Processing: Equipment Design and Commercial Applications — •Stefan Toepfl — DIL German Institute of Food Technologies, Quakenbrueck, Germany

Pulsed electric fields allow a short-time, low energy disintegration of plant and vegetable tissue as well as preservation of liquid media. In comparison to a thermal processing product quality and freshness are retained for heat sensitive products. For plant and vegetable tissue an increase of juice or oil yield during pressing or extraction is observed. The techniques impact on textural properties allows a targeted modification of structural properties, e.g. to enhance cutting performance. Low energy and time requirements are major benefits in comparison to a mechanical grinding or a thermo-break application. To allow a preservation of heat sensitive liquids, the inactivation of target strains such as (E. coli, L. innocua and S. cerevisiae) in orange juice, mango and melon puree as well as smoothies has been evaluated. An inactivation of 4 to 5 log cycles has been achieved. An increase of shelf life from 7 to 21 days has been obtained. Since 2011 is commercially used in European Food industry. Equipment with an average power of up to 80 kW has been developed. Dependent on type of application tubular as well as belt treatment chambers are available. At present a capacity of up to 50 t/h can be achieved for cell disintegration. For preservation of heat sensitive liquids units with a capacity of up to 5.000 l/h have been realized. During the presentation application examples will be shown and the technical, commercial and legal framework will be discussed.