

DEVELOPMENT OF A TOROIDAL EB SOURCE FOR NON-THERMAL ELECTRON TREATMENT OF BULK GOODS

Ignacio Gabriel Vicente-Gabás, Ralf Bluethner, André Weidauer, Sebastian Schmidt,
Goesta Mattausch, Frank-Holm Roegner

*FEP - Fraunhofer Institute for Organic Electronics,
Electron Beam and Plasma Technology
Winterbergstrasse 28, 01277 Dresden, Germany*

ABSTRACT

In non-thermal treatment processes, chemical or biocide effects of accelerated electrons are commonly utilized for sterilizing medical products, sanitizing food, curing lacquers, drying printing inks and cross-linking polymers. Scanned or broad-beam electron sources of different power ratings and geometric dimensions are commercially available in the energy range up to several MeV. Nevertheless, whenever shaped surfaces or parts should be all-side treated, cost and complexity of the systems rise up to a degree that frequently makes utilization of EB technology unprofitable.

To overcome this shortfall, FEP has developed the demonstrator of a toroidal electron beam source during the last years. It delivers an annular electron flux pointing radially inwards. The electrons are accelerated in vacuum first and then pass a cylindrical Lenard window to finally reach the target at ambient pressure. Facilitated by this design, the new electron beam generator allows for a largely simplified all-side treatment of shaped parts and bulk goods in a single pass.

The free electrons forming the beam are stroke out of a cold cathode by impinging ions, which were extracted from an auxiliary gas discharge since simple diode designs are no longer practicable at acceleration voltages in the 100 kV range needed for the desired treatment processes. Additional means are required to sustain the plasma at lowest possible pressure in the source and to control it in accordance with technological demands. Two different discharge configurations were investigated by simulations and experimentally: Magnetic enhancement in ExB geometry, and a thin-wire anode.

Thanks to the simplified treatment routines and potential costs reductions, some formerly envisioned applications may be revisited, and new ones can be made accessible more easily. Promising examples will be shown in the presentation, with emphasis on seed dressing as a lead application.

Presenting author: Ignacio Gabriel Vicente-Gabás

E-Mail: ignacio.vicente@fep.fraunhofer.de

Phone: +49 351 2586 502