NASA SBIR/STTR Technologies

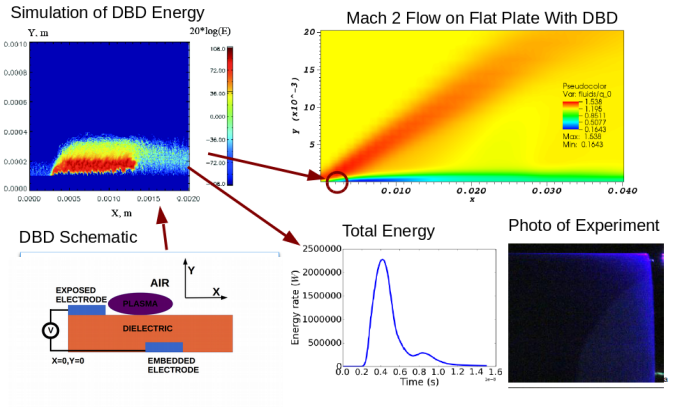
NNX11CA46C - Simulation Tool for Dielectric Bar Discharge Plasma Actuators at Atmospheric and Sub-Atmospheric Pressures

PI: Peter Stoltz Tech-X Corp, Boulder, CO

Identification and Significance of Innovation

We developed a tool for optimization of DBD plasmas used for actuators using efficient, comprehensive, physically-based models for different operation conditions. This will allow NASA researchers to more quickly evaluate designs. This tool can treat the system using kinetic, fluid or hybrid models. The tool is partially validated by comparison with the experimental data taken specifically for this project, but with only limited agreement to within factors of 0.5 – 5.0. This tool is built on the already commercial software, VSim.

Expected TRL Range at the end of Contract (1-9): 4



The simulation tool for DBD plasma actuation.

Technical Objectives and Work Plan

Objectives:
The objective of this project is to develop an efficient and faster simulation tool for DBD modeling in a wide range of gas pressures and to demonstrate the simulation tool through validation against experimental data.

Work Plan:
The objectives were achieved by the extension of air-chemistry tools, implementation of photoionization models, enhancement of the hybrid simulations, integration of multilevel meshing and adaptive time steps, implementation of circuit models, and validation with experimental data.

NASA and Non-NASA Applications

The primary NASA applications of the proposed DBD simulation tool are active flow control concepts.

Active flow control using DBD plasma actuators is of interest to a number of government agencies, private industry and universities. This tool will be beneficial for subsonic/hypersonic programs which involve active flow separation control, as well as in the commercial medical industry.

Firm Contacts

Dr. Peter Stoltz, pstoltz@txcorp.com, 720-563-0336