

Abstract Submitted
for the DPP15 Meeting of
The American Physical Society

Control of plasma properties in a short direct current glow discharge with active boundaries¹ VLADIMIR DEMIDOV, WVU, AFRL, STEVEN ADAMS, AFRL, YEVGENY BOGDANOV, SPbGU, MARK KOEPKE, WVU, ANATOLY KUDRYAVTSEV, SPbGU, IYA KURLYANDSKAYA, ITMO University, SPbGU — To demonstrate controlling electron and metastable density ratio and electron temperature by applying negative voltages to the active (conducting) discharge wall in a low-pressure plasma with nonlocal electron energy distribution function, modeling has been performed in a short (without positive column) dc glow discharge with a cold cathode. The applied negative voltage can modify trapping the low-energy part of the energetic electrons emitted from the cathode sheath and arising from the atomic and molecular processes in the plasma within the device volume. Those electrons are responsible for heating the slow, thermal electrons, while production of slow electrons (ions) and metastable atoms is mostly due to energetic electrons with higher energies. Increasing electron temperature results in increasing decay rate of slow, thermal electrons, while decay rate of metastable atoms and production rates of slow electrons and metastable atoms practically are unchanged. The result is in variation of electron and metastable density ratio and electron temperature with variation of the wall negative voltage.

¹A part of this research was performed, while one of the authors (VID) held a National Research Council Research Associateship Award at AFRL. The work was also partially supported by SPbGU (Grant No. 11.38.658.2013) and ITMO University (Grant No. 713577).

Vladimir Demidov
WVU, AFRL

Date submitted: 15 Sep 2015

Electronic form version 1.4