A Turing model for pattern formation in atmospheric pressure gas discharges

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We propose a Turing model for the formation of patterns of the visible light emission intensity in atmospheric pressure gas discharges. The celebrated Turing model in pattern dynamics includes coupled nonlinear reaction-diffusion equations of an activator and an inhibitor. In our model the electron density and the electron temperature are chosen as the activator and the inhibitor respectively, with the activator diffusion coefficient assumed to be much smaller than that of the inhibitor, and the ionization and excitation from the excited state atoms considered as the major reaction processes. The model can reproduce striations in a 1D microplasma system, which quantitatively agree with experimental results in terms of the spatial variation scale lengths. The model can also predict the transition from spatially periodic to uniform in discharge structure when the discharge conditions change.

This work is supported by the NSFC grant (No 11075093).