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Thermal mechanism of prepeak formation in Pulsed Glow Discharge MAXIM VORONOV, VOLKER HOFFMANN, Leibniz Institute for Solid State and Materials Research (IFW) Dresden, Germany, TOBIAS STEINGROBE, WOLFGANG BUSCHER, CARSTEN ENGELHARD, University of Münster, Institute of Inorganic and Analytical Chemistry, Germany, ANDREW STOREY, STEVEN RAY, GARY HIEFTJE, Indiana University, Department of Chemistry, USA, NIMESA COLLABORATION[1] — A microsecond Pulsed Glow Discharge (μs PGD) in a Grimm-type source is characterized by the so-called "prepeak," which is a spike in both electrical current and emission intensity at the leading edge of the discharge pulse. The prepeak is followed by synchronized vibrations of the current and the emission. To understand the nature of these phenomena, a microphone was inserted into the discharge chamber. Acoustical waves were detected and found to be in correlation with the measured vibrations. This points to a thermal mechanism for prepeak formation: the gas is heated in the leading edge of the discharge pulse and then expanded. To prove this suggestion, a Monte-Carlo based model was developed to simulate the evolution of Ar concentration, temperature, and flow in time and space. Potentially, the model could be used for gas simulations in a wide range of different applications. Here, the model is incorporated into an existing but modified model of the μs PGD in a Grimm-type plasma excitation source. Results of the simulations confirm that the thermal mechanism is responsible for the formation of the electrical prepeak and the pressure waves.

[1]International Collaboration in Chemistry: Novel Instumentation for Modern Elemental Speciation Analysis

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