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Suppression of Instability of High Pressure DC Microplasma Operating in the Negative Differential Resistance (NDR) Regime[1] RAJIB MAHAMUD, TANVIR I. FAROUK, University of South Carolina — Microplasma devices have been the subject of considerable interest and research during the last decade. In a DC system most of the operation regime of the plasma discharges studied fall in the "abnormal," "normal" and "corona" modes - where a quasi-steady state is achieved. It is well known that even in a DC system the negative differential resistance (NDR) regime can trigger self pulsing discharges. These pulsations are initiated by the parasitic capacitance of the system hence governed by the response time of the power circuit. The circuit response time is required to be larger than the ion transit time to initiate the oscillations. In this present study a suppressor circuit element in the form of an inductor is used to restrain the plasma from switching to a self pulsing mode. It has been identified that the combined response time of the inductor and the plasma discharge (L/Rplasma) has to be larger than the power circuit time constant (RC) to achieve suppression. Inhibition of oscillation has been observed in both experiments and numerical simulations. The obtained voltage-current characteristics show that the inductor element extends the normal glow regime to lower current. Additional parametric simulations are conducted to map out a "stable" operation regime.

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