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Dynamics of unstable Ar/Cl_2 inductive discharges EMILIE DESPIAU-PUJO, PASCAL CHABERT, LPP - CNRS/Ecole Polytechnique, ALLAN J. LICHTENBERG, UC Berkeley — Instabilities have been observed in inductively coupled Ar/Cl_2 discharges near the transition between capacitive (E) and inductive (H) modes [1]. A global model, based on five particle balance equations and one electron energy balance equation, was previously proposed to describe the instability mechanism in pure chlorine [2]. The consideration of multiple ions and dissociated neutral species showed that gas chemistry had a significant influence on the unstable cycle but the quantitative predictions of the model could not be compared to measurements. In this paper, argon is added to the model. The influence of argon dilution on the instability process is investigated and simulations and experiments are compared. When adding chlorine to the mixture, the unstable window broadens in absorbed power but narrows in pressure. The frequency of oscillations increases both with pressure and chlorine content. Although some quantitative differences remain, numerical predictions of instability frequency and charged particles densities are in reasonable agreement with experimental data.

[1] CS Corr et al, App. Phys. Lett. 86, 141503 (2005)
[2] E Despiau-Pujo et al, Plasma Sources Sci. Technol. 18, 045028 (2009)

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