Abstract Submitted
for the GEC11 Meeting of
The American Physical Society

Low pressure hydrogen discharges diluted with argon explored using a global (volume averaged) model JON TOMAS GUDMUNDSSON, Shanghai Jiao Tong University, ARON TH. HJARTARSON, EYTHOR G. THORSTEINSSON, University of Iceland — A steady state global (volume averaged) model is used to explore the plasma parameters and the plasma chemistry of a low pressure (1–100 mTorr) high density hydrogen discharge that is diluted with argon [1]. The electron density increases, the dissociation fraction of hydrogen increases and the electron temperature decreases with increased argon dilution. We find that H_3^+ is the dominant positive ion up to about 30 % argon dilution at 10 mTorr, were ArH^+ becomes the dominant positive ion. The reaction rates for the creation and destruction of various species are explored versus the discharge pressure. In particular we explore the role of the vibrationally excited levels of the hydrogen molecule in the creation of the negative ion H^- through dissociative attachment. The role of the ArH^+ ion in the discharge chemistry is discussed and we find that ArH^+ plays a significant role in the destruction of the H^- ion. Furthermore, the creation and destruction of H_3^+ and ArH^+ ions are explored. The electronegativity increases with increasing H_2 content and reaches a value of approximately unity in a pure H_2 discharge at 100 mTorr.

[1] A. T. Hjartarson, E. G. Thorsteinsson and J. T. Gudmundsson, Plasma Sources Sci. Technol. **19** (2010) 065008

Jon Tomas Gudmundsson
Shanghai Jiao Tong University

Date submitted: 20 Jul 2011 Electronic form version 1.4