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Optimization of  $H_2$  Production in  $Ar/NH_3$  Micro-discharges<sup>1</sup> RAMESH ARAKONI, ANANTH N. BHOJ, University of Illinios, MARK J. KUSH-NER, Iowa State University — Hydrogen powered vehicles and portable fuel cells may require real-time generation of H<sub>2</sub> to provide fuel safely and with rapid response. One such method is to produce  $H_2$  from feedstock gases that can be more safely stored, such as  $NH_3$ . Microdischarge plasmas are being investigated as a means of  $H_2$  production from  $NH_3$  and other gases. The high power densities (10s  $kW/cm^3$ ) that can be obtained in microdischarges provide an intense source of electron impact as well as thermal decomposition of the feedstock gases. By operating at high pressures (> 100 s Torr), reformation of the dissociated products leads to efficient production of  $H_2$ . In this work, results from a computational investigation of production of  $H_2$  in high pressure microdischarges sustained in  $Ar/NH_3$  mixtures will be discussed. Plug-flow and 2-dimensional plasma hydrodynamics models were used to develop scaling laws to optimize the energy efficiency of the process (e.g.,  $eV/H_2$  molecule produced). The 2-d model resolves non-equilibrium electron, ion and neutral transport using fluid equations. The microdischarge geometry of interest is a sandwich flow-through reactor with a central hole a few hundred microns in diameter, power of a few W and residence times of a few microseconds.

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