

Abstract Submitted
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A spectroscopic study of the initial stages of pulsed glow discharges in noble gases¹ V.I. DEMIDOV, West Virginia University, S.F. ADAMS, AFRL, E.A. BOGDANOV, A.A. KUDRYAVTSEV, St. Petersburg State University, J.M. WILLIAMSON, UES, Inc. — The dynamics of the rapid growth of electron and metastable atom densities at the beginning of a pulsed dc discharge in argon was explored by investigating the relationship between the strength of the applied electric field and the measured emission line intensities at 419.8 and 420.1 nm. Data showed that when the electric field strength was low, the growth of the metastable atom density began before the growth of the electron density. The opposite relationship was observed when a higher strength electric field was applied. This observed dependence can be confirmed by modeling the argon dc discharge. Furthermore, similar measurements for the 345.4 and 347.3 nm spectral lines in neon and the 480.7 and 467.2 nm spectral lines in xenon suggest analogous behaviors in these noble gases. Thus, spectral measurements of the above lines could be a sensitive indicator of the presence of noble gas metastable atoms in plasmas. This relationship could be used to control plasma properties, a tool that would be useful for many technological applications.

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