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Measurement of electron temperature and density of the coaxial focused plasma in accordance with insulator lengths for extreme ultraviolet (EUV) lithography

Young June Hong, Min Wug Moon, Gi Chung Kwon, Yoonho Seo, Guangsup Cho, Hee Myoung Shin and Eun Ha Choi

Charged Particle Beam and Plasma Laboratory/PDP Research Center,
Department of Electrophysics, Kwangwoon University

We have generated Ar plasma in dense plasma focus device of coaxial electrode for extreme ultraviolet (EUV) lithography and investigated an emitted visible light for electro-optical plasma diagnostics. We have applied an input voltage 4.5 kV to the capacitor bank and the diode chamber has been filled with Ar gas of pressure 40 mTorr. The inner surface of cylindrical cathode have been attatched by an acrylic insulator. Theelectron temperature and density of the coaxial plasma focus were obtained by the optical emission spectroscopy (OES). The electron temperature has beenmeasured by the two relative line intensity and Boltzmann plot. In case of electron density, it has been observed by the Stark broadening method. This experiment shows that the electron temperature and density characteristics for a focused plasma can be influenced by the acrylic insulator length installed onto the cathode surface. In the case insulator length of 40 mm, the electron temperatures has been the highest value of 2.31 eV and 2.50 eV in comparision with other insulator lengths by the relative line intensity and Boltzmann plot method, respectively, while the electron density is found to be the lowest value of 4.62 x 1017 cm-3at this insulator length. The EUV emission signal whose wavelength is about 6 ~ 16 nm has been detectedby using a photo-detector (AXUV-100 Zr/C, IRD).