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Publication Date
2005-04-12

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SMMIB 2005
Kusadasi, Turkey, September 4-9, 2005

SOURCES OF HIGH-DENSITY GASEOUS PLASMA BASED ON A DISCHARGE WITH ELECTRON INJECTION

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A novel technique of high-density gaseous plasma generation was explored, and several plasma sources based on this technique were developed. The sources utilize a DC high-current (up to 35 A) gaseous discharge with electron injection into the cathode region. Electron generation and injection is accomplished by using an additional arc discharge with a cold hollow cathode. Low contamination of plasma is achieved by low discharge voltage (avoidance of sputtering), as well as by special geometric configuration of the emitter discharge electrodes thereby filtering (removing) the erosion products stemming from the emitter cathode.

The devices produce a uniform and stable gaseous plasmas with density up to 10^{11} cm^{-3} in a volume of 1 m^3, at the pressure of $3 \cdot 10^{-4}$ Torr and higher. The sources are characterized by high reliability, low maintenance and long lifetime. The specific electric power consumption is 140 eV per one generated ion. The sources operate with noble gases, nitrogen, oxygen and hydrocarbons, and can be used for plasma immersion ion implantation and other ion technologies.

This work was supported by the U.S. Department of Energy, Initiatives of Proliferation Prevention, project IPP-LBNL-T2-196, under Contract No. DE-AC02-05CH11231, and by Russian Foundation for Basic Research under the grant RFBR # 05-02-16256, and Grants of the President of Russia MK-1855.2004.2 and MD-148.2203.02.

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3 Presentation preferred: Poster
4 Topic: Techniques and Equipment Development