PT-P005

Discharge Characteristics of Large-Area High-Power RF Ion Source for Neutral Beam Injector on Fusion Devices

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The large-area high-power radio-frequency (RF) driven ion sources based on the negative hydrogen (deuterium) ion beam extraction are the major components of neutral beam injection (NBI) systems in future large-scale fusion devices such as an ITER and DEMO. Positive hydrogen (deuterium) RF ion sources were the major components of the second NBI system on ASDEX-U tokamak. A test large-area high-power RF ion source (LAHP-RaFIS) has been developed for steady-state operation at the Korea Atomic Energy Research Institute (KAERI) to extract the positive ions, which can be used for the NBI heating and current drive systems in the present fusion devices, and to extract the negative ions for negative ion-based plasma heating and for future fusion devices such as a Fusion Neutron Source and Korea-DEMO. The test RF ion source consists of a driver region, including a helical antenna and a discharge chamber, and an expansion region. RF power can be transferred at up to 10 kW with a fixed frequency of 2 MHz through an optimized RF matching system. An actively water-cooled Faraday shield is located inside the driver region of the ion source for the stable and steady-state operations of RF discharge. The characteristics and uniformities of the plasma parameter in the RF ion source were measured at the lowest area of the expansion bucket using two RF-compensated electrostatic probes along the direction of the short- and long-dimensions of the expansion region. The plasma parameters in the expansion region were characterized by the variation of loaded RF power (voltage) and filling gas pressure.

Keywords: Fusion, Neutral Beam Injector, RF ion source, Beam extraction, Plasma parameter

PT-P006

Improve the Transparency of Liquid Crystal Display Using Hybrid Conductive Films Based on Carbon Nanomaterials

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We present highly transparent liquid crystal displays (LCDs) using hybrid films based on carbon nanomaterials, metal grid, and indium-tin-oxide (ITO) grid. Carbon based nanomaterials are used as transparent electrodes because of high transmittance. Despite of their high transmittance they have relatively high sheet resistance. To solve this problem, we applied grid and made hybrid conductive films based on carbon nanomaterials. Conventional photolithography processes were used to make a grid pattern of metal and ITO. To fabricate transparent conductive films, carbon nanotube (CNT) ink was spin coated on the grid pattern. The transparency of the conductive film was controlled by shape and size of the grid pattern and the thickness of CNT films. The optical transmittance of CNT-based hybrid films is 92.2% and sheet resistance is also reduced to 168 Ω/square. These substrates were used for the fabrication of typical twisted nematic (TN) LCD cells. From the characteristics of LCD devices such as transmittance, operating voltage, voltage holding ratio our devices were comparable to those of pristine ITO substrates. The result shows that the hybrid conductive films based on carbon nanomaterials could be alternative of ITO for the highly transparent LCDs.

Keywords: Liquid Crystal Display, Transparent Electrodes, Carbon materials, grid