Development of the Cs-seeded RF negative ion beam source

Min Park [1], Tae-seong Kim [1], Seung Ho Jeong [1], and ByungKeun Na [2]

[1]Korea Atomic Energy Research Institute, Korea, Republic of

[2]National Fusion Research Institute, Korea, Republic of

A Cesium (Cs) seeded RF negative ion beam source is being developed towards ITER neutral beam injector (NBI) technology. The final performance objective of the source is to produce 200 keV, 0.5 A deuterium negative ion beams. The source is mainly composed of the RF inductively coupled plasma (ICP) source, the expansion chamber equipped with a Cs dispenser and magnetic filter fields, and the 3-grid acceleration system. To enhance the production of negative ions, evaporated Cs from the Cs dispenser is seeded into the expansion chamber and the sufficient negative ions are produced from the Cs-deposited inner wall surfaces. In particular, the thickness of the deposited Cs layer on the surface of the plasma grid (PG) is the key factor for the production of the negative ions significantly contributing to the extracted negative ion beams. For this reason, the Cs evaporation rate from the dispenser, along with the PG surface temperature, is controlled simultaneously to find the best condition for the maximum negative ion density. Detailed designs of the whole system and the experimental results are presented.