PERMANENT MAGNET MICROWAVE-DRIVEN ION SOURCE FOR NEUTRON GENERATION

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Abstract

The basic principle of a neutron generator is to bombard an ion beam of either deuterium or tritium onto a target, where neutrons are produced via the D/T reactions. Compared with RF-driven and Penning Ion Sources commonly used in neutron generators, the 2.45 GHz ECR ion source has the advantages of high power efficiency, high fraction of atomic ions, low gas pressure. For portable application, the ECR source can be built with permanent magnets to minimize size. Results published by Gobin(*) and Song(**) using permanent magnets have shown current densities more than that required in neutron generator applications. In our study, we are trying to simplify the coupling between the magnetron and the plasma chamber in order to achieve either improved system efficiency or compactness. For example, in one case, a pyrex tube is inserted at the end of a wave guide as the plasma chamber. In another case, the plasma chamber has the same cross-sectional dimension as the wave guide for matching the producing of a slit beam. Results such as the current density, ion species, and plasma density profile inside the plasma chamber, as functions of microwave power and gas pressure will be presented.

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