THE INFLUENCE OF THE GAMMA-EFFECT OF THE CATHODE ON THE IECF DRIVING LOW CONSUMPTION ELECTRICITY

M. Utsumi
Faculty of Engineering, Tokai University,
K Taira
Graduate School of Engineering, Tokai University,
Y. Taniuchi and Y. Matsumura
Graduate School of Science and Technology,Tokai University
1117 Kitakaname, Hiratsuka-shi, Kanagawa, Japan 259-1292
M.Chiba
Tokyo Metropolitan University, 1-1 Minami-Osawa, Hachioji-shi Tokyo, Japan 192-0397
M.Fujii
Shimane University Faculty of Medicine, 89-1 Kajiya, izumo-shi, shimane, Japan 693-8501

An Inertial Electro-static Confinement Fusion (IECF) device is one of the candidates among the neutron sources, and it is possible to produce the neutrons by a compact device of simple configuration. The IECF is a concept for electro-statically confining high-energy fuel ions in a spherical potential well. It consists of two grid electrodes, radii are different and centers are same. An inner sphere grid is a cathode and outer sphere grid is an anode. In a low current glow discharge, generated ions oscillate inside of the spherical anode and interacts gas molecules or cathode. Neutrons are produced by the fusion interaction that mainly results from oscillated ions and gas molecules (beam-beam), oscillated ions and molecules absorbed deuterons inside the cathode (beam-cathode), first neutrals and gas molecules (neutral-background).

One of the methods to increase the Neutron Production Rate (NPR) is to use hydrogen absorption metals for grid cathode. However, it has been reported that the effect of the hydrogen absorption metals was a little in increasing the NPR in hot cathode glow discharge. This is because the cathode was rapidly heated by ion bombardment. In the high-power IECF device, the cathode temperature goes up to over 1000 K so that deuterium atoms were desorbed. In spite of that, the use of Ti grid cathode enhances the NPR in our measurements. This is because the little electrons released at the Ti cathode by the ion impact (γ effect). If there is little γ effect of the cathode surface, ion density increases near the cathode. The present work is intended to clarify the efficacy of little γ effect of the cathode surface. In these experiments, the NPR was measured in low-power glow discharge condition. In other words, the present work is to pilot the future possibilities of the use of little γ effect of cathode materials.

1. P.T. Fransworth, “Space Charge Device for Producing Nucl ear Reactions” Canadian Patent, 654, 306, 1962
2. R. L. Hirsh, “Inertial-Electrostatic Confinement Ionized Fu sion Gases” J. of Appl. Phys, 38, 4522, 1967