TRITIUM DOPING METHOD FOR FABRICATION OF TRITIUM DOPED POLYSTYRENE SHELL TARGETS

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Tritium doping methods for fabrication of tritium doped deuterated polystyrene (T-CD polystyrene) shell targets were developed. The targets enable to measure the ion temperature and ρR of the plasma, and also improve the neutron diagnostic under hard X-ray environment such as fast ignition. To avoid using a large amount of tritium (~100 TBq) for preparing tritiated emulsion, tritium was doped into deuterated polystyrene shell in tritium atmosphere (Wilzbach method). Tritium doping rate of this method is, however, too low to fabricate the targets. In this study, we present enhancement methods for tritium doping with ultra-violet (UV) irradiation and glow discharge plasma irradiation.

In the UV irradiation method, the 4th harmonics of Nd:YAG laser (266 nm) was irradiated to duterated-polystyrene film in tritium atmosphere for 2 hours. Laser energy was 10 mW at 3-mm-diameter spot sizes. The tritium concentration of the surface was measured by imaging plate (BAS-IP TR) with 10-min-exposure and calibrated by tritium standard source. The tritium concentration of the irradiated point indicates higher concentration and its radioactivity was 1.4×10^{11} Bq/g. Figure 1 shows the tritium concentration of the UV irradiated film.

In the other method, the plasma irradiation method was carried out. The voltage of DC 250 V was applied to hydrogen gas (120 Pa, H:D:T = 82:13:5) and the plasma was irradiated to polystyrene film for 1 hour. The tritium concentration of the irradiated surface was 2.0×10^{11} Bq/g.

With increasing of irradiation time and partial pressure of tritium, these methods are achievable to fabricate 1 % tritium doping shells which have 6.6×10^{11} Bq/g radioactivity. These methods contribute safe to target supply because of less tritium consumption.

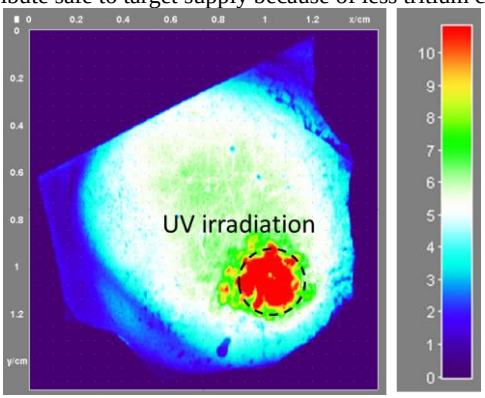

Figure 1 The tritium concentration of UV irradiated film measured by imaging plate with 10 min exposure and values shows PSL counts. The concentration of UV irradiated point indicates the higher concentration due to UV enhancement.