

ThuPS36

A compact pulsed neutron generator with a high-current vacuum arc ion source

Zhen Yang, Jie Li, Jidong Long, Chaohui Lan, Tao Wang, Pan Dong, Le Zheng, and Ping Liu

Institute of Fluid Physics, CAEP, P. O. Box 919-106, Mianyang, China

Corresponding Author: Zhen Yang, e-mail address: yangzhen@caep.cn

Recently, due to specific features of compact neutron generators, their demand in neutron radiography, elemental analysis and detection of the illicit materials has been increased. The compact neutron generator is more environmentally friendly, safer for operators, more sensitive and suitable for research work with illicit materials. The pulsed operations of such a neutron generator using the deuterium-deuterium fusion reaction are reported. The main embodiment of this type of generator includes a vacuum arc ion source with deuterated electrode, a single electrode acceleration gap and one deuterated titanium target. In order to suppress the large amount of secondary electrons, an idea which uses a grid and a resistor to provide self-biased voltage was introduced. The neutron generator was operated at 100 kV acceleration potential, 10^{-4} Pa vacuum environment and hundreds mA ion beam current. The neutron generator is capable of producing up to 10^5 n/p. In this report, we will discuss various physical and technical issues related to the components of the generator and the operation of the generator.

References

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