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Stability and Lifetime of Scandium Deuteride Film Cathode in a Vacuum Arc Ion Source

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The vacuum arc discharge with a deuterium impregnated metal cathode is a popular source of deuterium ions, which is widely used in neutron generators [1-3]. Recently, metal deuteride film cathode for vacuum arc discharge is studied by Efim M. Oks [1,4]. This paper reports on a study of the properties of the plasma and gas produced in a vacuum arc discharge with Scandium deuteride thin film (ScD_{1.8}) cathode which have been deposited on Mo by sputter magnet. The ScD_{1.8} cathode allow the generation of multicomponent gases and ions. The stability and lifetime of the vacuum arc system to produce deuterium ions is analyzed by analyzing the gases releasing quantity, atomic fractions ratio of deuterium with metal (D:M) and neutron yield.

Fast Response Vacuum Gauge and Quadrupole Mass Spectrometer were used in the research of gases releasing quantity. The total gases releasing quantity is stability with the number of discharge. While the deuterium gas releasing quantity is fluctuation and also decrease with the number of discharge. Magnetic mass spectrometry was used in the research of atomic fractions ratio of deuterium with metal. As the number of discharge increases, the stability of atomic fractions ratio is getting worse and the ratio of deuterium ions is decreasing. Finally, nuclear analysis method was applied for studying the absolute content of deuterium ions. The result was similar to that of the magnetic mass spectrometry experiment. The stability of neutron yield is getting worse and the total amount of neutron yield is decreasing.

Key words: vacuum arc discharge, scandium deuteride film cathode, deuteride releasing, Magnetic mass spectrometry, nuclear analysis method

References

- [1] Savkin K P, et. al., Rev. Sci. Instrum. 2016, 87, 02A904.
- [2] Barengolts S A, et. al., Tech. Phys. 2015, 60, 989.
- [3] Yushkov G Yu, et. al., Tech. Phys. 2014, 40, 1072.
- [4] Savkin K P, et. al., IEEE Trans. Plasma sci., 2015, 43(8), 2318-2322.

Authors: Dr WANG, Tao; Ms ZHEN, Le; Dr LIU, Feixiang; Dr YANG, Zhen; Ms LI, Jie; Ms DONG, Pan; Prof. LONG, Jidong; Prof. ZHANG, Linwen

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