

Energy spectrum of ions in CeO₂ plasma of vacuum arc discharge

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Plasma mass separation method is one of the possible solutions to the spent nuclear fuel reprocessing problem [1, 2]. The technology consists of such steps as conversion of the working substance into the plasma and creating electromagnetic field to assign particle trajectories. In current work vacuum arc discharge with a hot cathode is used as a plasma source to model the first named stage of the method [3]. The hot cathode is made of cerium (IV) oxide, which simulates properties of components of the oxide nuclear fuel. The main goal of the work is to study energy parameters of the ion component of the after-anode plasma, as they affect particle trajectories during the separation process. To perform the measurements a specially designed multigrid retarding field energy analyser [4] was used. The average ion energy proved to vary from 8 to 14 eV. Then, the evolution of the mean particle energy through time was compared with that of arc voltage. Possible relation between these two properties is shown. Finally, obtained ion energy is used to modify the results of condensation probe measurements by switching from mean charge of plasma flux to plasma ionization degree. The work is supported by the President of the Russian Federation grant MK-5652.2021.1.2.

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