

## INFLUENCE OF MAGNETIC FIELD INDUCTION ON THE ENERGY OF IONS AND INJECTION PROCESSES OF IONIZED FLOWS OF WORKING SUBSTANCES IN A PLASMA MASS SEPARATOR\*

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The concept of plasma mass separation of substances in a configuration with a potential well [1] implies the development of specialized plasma sources [2]. The conversion of condensed matter into a low-temperature plasma flow and its further injection into the separation chamber is a crucial stage that largely determines the efficiency of the technological process. It is especially important if the aim of the concept is the separation of spent nuclear fuel (SNF).

Figure 1 shows a scheme of the created device. The mixture of working substances is placed in a molybdenum crucible. At this stage, silver and lead are used as model substances, which simulate the “light” and “heavy” components of SNF, respectively. The crucible is heated up to 1000-1450°C by the induction method. The substance in the form of vapor enters the discharge gap and is ionized. The generated plasma penetrates into the separation chamber along the magnetic field lines (magnetic induction 1400 G) through the cavity in the anode.

As part of the study, the following plasma parameters were measured: plasma density, source productivity or ion saturation current, optical emission spectra, energy spectrum of ions of working substances depending on the value of the magnetic field induction (0-1400 G). The characteristic FWHM of the energy distribution is 7-15 V. The average energy varies from 14 eV to 22 eV.

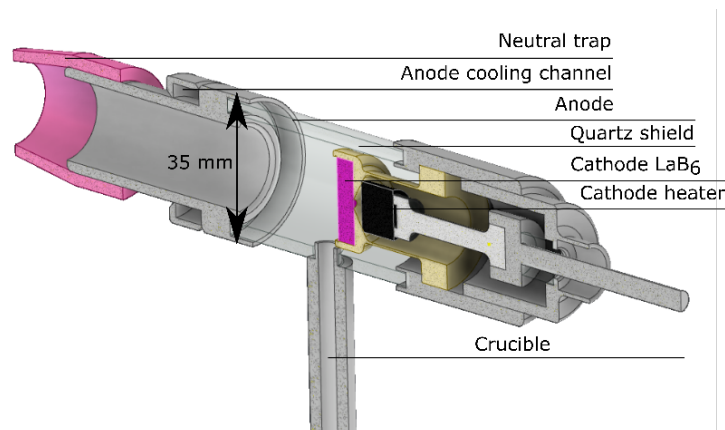


Fig.1. Scheme of the plasma source of model substances.

A productivity rate of the source of 20 g/h was reached, which corresponds to an ion current of 2.6 A at the discharge current of 120 A. With these parameters, the current-voltage characteristic is growing. The plasma concentration at the outlet of the source is about  $10^{12} \text{ cm}^{-3}$ .

The possibility of switching from one working substance to another with diverse saturated vapor pressure while maintaining the working potential difference between the cathode and the anode has been experimentally demonstrated.

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