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Development and Experimental investigation of new type ICB

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The new ICB source is developed. Its novelty lies in the fact that the ionization chamber and the metal source chamber are spaced in one cylindrically shaped shell and are not divided in electric circuit. The installing of based on permanent magnets magnetic system is also provided.

The presented construction is significantly compact in comparison with the previous models, thus, the sufficiently high crucible temperatures (up to 2000 K) can be obtained. The ionization rate can also be improved by means of magneto-electrical electrons holding, which prolongs the electrons lifetime in the ionization area and hence, increases the possible number of ionization events.

The experimental investigations of ICB source are projected in order to find the stable operation regimes domain, where deposition rate fine adjustment in the given range is possible, and also the region of density uniformity for ion current on the substrate with maximum ionization degree can be obtained.

In these purposes the following experiments have been conducted:

1. The investigation of VA characteristics for various electric circuit diagrams and for different mutual arrangement of crucible and filament
2. The investigation of ion current density behavior by means of Faraday cap, under different ICB source operating regimes.
3. The investigation of crucible temperature dependence on radiation and emission heating.
4. The investigation of deposition rate dependence on the crucible temperature

So, e.g., under deposition rate equal to 0.4 Å/sec, the mean ion current density on the substrate reaches 1.5 μA/cm2, which comprises 2.8 % of the whole metal flow to the substrate. The diameter of the spot with uniform ion current density ±10% on the substrate comprises no less than 150 mm, that satisfactory meets the demands to the ion sources of such type.