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CLEANING SYSTEM FOR DIELECTRIC SUBSTRATES

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The main disadvantage of ionic surface cleaning methods before the metallization process in microelectronics production is that, in order to obtain an effective result, the substrates are exposed to high-energy ion flows. During long-term treatment, a potential arises on the surface that is comparable to the energy of ions, which contributes to the breakdown of thin dielectric substrates, as well as the formation of defects associated with the action of charges. A decrease in the ion current inevitably leads to a deterioration in the quality of product preparation and a decrease in the adhesion strength of the coating. For this tasks of finish cleaning of the substrate dielectrical material and surface activation before the coating process an ion-plasma source basis of a controlled gas-discharge was developed (Fig. 1).To organize the movement of charged particles generated in the gas discharge in the direction of the cathode (neutralizer) an external magnetic field generated by a solenoid is used.

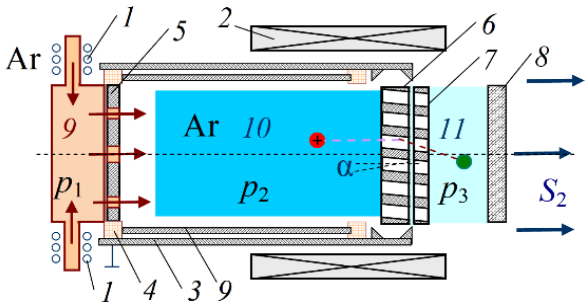

Fig. 1. Design of a controlled gas-discharge source.

Electrical scheme of the developed source consists of a cathode (neutralizer) *6*, anode *3* and a supplementary electrode *9*. The anode is grounded and on the supplementary electrode a floating potential is set. Supply system of a working gas (argon) consists of a prior warm-up device *1* and a gas distributor *5*. The latter provides the alignment distribution of the gas atoms in the discharge existence zone, which occupies the inner volume of the source *10*.

The major part of the fast atoms stream that bombards the surface of the processed dielectric is formed as a result of the recharge of the high-energy ions due to the reflection from the walls of the output channels in the cathode *6*. To organize the movement of charged particles which are generated in the gas discharge in the direction of the cathode (neutralizer) *6* an external magnetic field generated by a solenoid *2* is used.

In the presence in the source volume of a working gas and under condition that a negative potential is set on the main cathode a gas discharge which occupies the inner volume of the source *10* is ignited. In this discharge positively charged ions are generated that are later accelerated by a cathode voltage drop. Neutralization of ions occurs generally due to their reflection from the main cathode *6*, but a minor part of charged particles is neutralized due to a resonant charge exchange. A fast directed stream of working gas atoms is formed as a result of both types of neutralization.

Received results showed that the minimum (optimal) operating pressure for the developed source $p_{1\ min}$ = 1…2 Pa. For higher pressures the ignition voltage is less than 800 V and with increasing pressure it slowly falls. The source allows modification of the dielectric surfaces by their bombardment with a flux of neutral particles with energies from tens of electronvolts to a few kiloelectronvolts.

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