THE DUST STRUCTURES CREATED IN INERT GASES BY THE BUNCH OF HEAVY ACCELERATED IONS

Prudnikov P.I., *1 Rykov V.A., 1 Zherebtsov V.A., 1
Meshakin V.I., 1 Glotov A.I., 1 Bazhal S.V., 1 Romanov V.A., 1
Andryushin I.I., 1 Vladimirov V.I., 2 Deputatova L.V. 2

1 SSC RF IPPE, Obninsk, Russia, 2 JIHT RAS, Moscow, Russia
*pavel.prudnikov89@gmail.com

In contrast to the previously performed experiments where dust structures have been obtained in tracks of accelerated protons [1] we made a series of experiments using the accelerator of heavy ions EGP-15 (Electrostatic Charge-exchangable Generator with energy of accelerated ions up to 15 MeV). The accelerated ions of carbon 12C have been used in the experiments. At first one-charged ions were accelerated (a charge is measured in the units of the electron charge). Then the ions went through the charge-exchange foil acquiring an energy of 12 MeV at a charge of 3 and a value of the accelerating potential of 4 MV. The ions arrived at the target unit going through the ion duct which was pumped up to the high vacuum condition. The experimental cell similar to the cell described in [1] was installed at the target unit.

The rectangular cross-section of the beam at the cell entrance was 6 mm in a height and 4 mm in a width. Since the gas in the cell was under the pressure the beam injected into the cell through the dividing foil which was made of aluminium with a 7 micron width. In the foil the carbon ions lost 9 MeV and changed their charge, on average, up to 3.6. In the experiments argon and helium were used. The particles were made of cerium dioxide.

In the gas the charge-exchange again took place and the charge has changed a little bit. The losses of the ions energies in the gas and a number of ion pairs created at the length unit have been calculated.

For the first time, the dust structures produced under the action of the heavy ions were obtained. The structures obtained are characterized by the increased sizes and more drawn forms in comparison with the structures obtained at the proton accelerator. The dependence of a form and a structure disposition upon the gas pressure and the applied voltage has been observed. The specific peculiarity of the structures obtained is the fact that there is a part with the well ordered particles at the structure front.