If we start from the premise that the piston pressure, which determines the shock-wave velocity, is equal to the magnetic pressure of the azimuthal field, then the latter lies in the range (2.5 - 4) × 10^5 Oe for all pressure intervals, in accord with the experimental data. The effect of "explosion" of current sheaths as they emerge to the faces of the electrodes undoubtedly takes place in all types of coaxial accelerators. At low pressures and sufficiently large escape currents this phenomenon leads to production of fast particles and to generation of high-temperature shock waves.

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ELECTRON ACCELERATION IN AN ONDULATOR SYNCHROTRON

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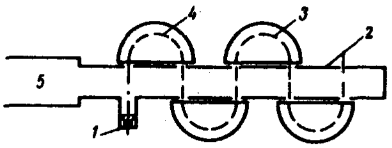
A method of accelerating charged particles in an ondulator synchrotron was proposed in [1]. This method results in intense electron beams with energy up to 5 - 10 MeV, satisfying the same stringent requirements with respect to the geometrical parameters and permissible energy spread as for electron beams accelerated in a microtron [2]. Unlike the microtron, however, in the ondulator synchrotron it is easy to produce high-voltage injection into an accelerating resonator with preliminary bunching of the electrons.

A 2-MeV ondulator synchrotron started operation at our institute. Its schematic diagram is shown in the figure.

The electrons are accelerated in a 10-cm-band resonator in which the H_{014} mode is excited. The resonator is made of a rectangular waveguide and measures 72 × 34 × 340 mm. Four through openings measuring 8 × 16 mm are kept in the resonator walls. This shape of the openings results in vertical focusing of the charged particles. The resonator is excited through a rectangular opening in the end wall by a pulsed 1.5 MW magnetron generator, with a pulsed duration 2 μsec.

The electrons are injected in the accelerating resonator from an electron gun operating at 150 kV and 600 mA. There is no preliminary bunching of the electrons. In each passage through the resonator, the electrons increase their energy by 350 keV at the maximum of the electric field and are then returned to the resonator at the next maximum of the electric field with the aid of "electron-mirror" turning magnets [3] installed in line with the resonator.



Schematic diagram of accelerator: 1 - injector, 2 - resonator, 3 - magnet, 4 - electron trajectory, 5 - exciting waveguide

The accelerator output current is 50 mA. The electron energy spread is 6%. The main electron loss occurs after the first passage through the resonator, after which the current is decreased in each passage because there is no focusing in the turning magnets. The electrons are focused only on going through the resonator.

Work aimed at increasing the intensity of the accelerated current is now in progress.

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EFFECT OF CARBON COATING ON THE SUPERCONDUCTING TRANSITION TEMPERATURE OF THIN CARBON-DOPED MOLYBDENUM

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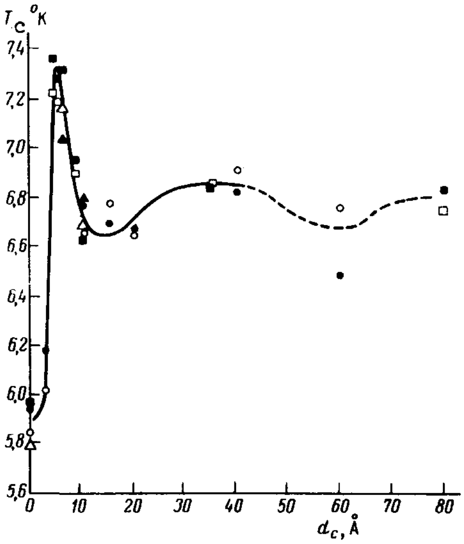
We investigated carbon-doped molybdenum films obtained by cathode sputtering at a Kr pressure of 10^{-5} Torr.

The apparatus described in [1] was improved to permit production of several samples in a single sputtering experiment and to deposit on them coatings of different thicknesses. Coatings of equal thickness were sputtered simultaneously on two samples that differed only in the film width ($w_1 = 3$ mm and $w_2 = 6$ mm). This made it possible to estimate the influence of the film edges and of random contaminations of the substrates. The partial pressure of all the residual gases, with the exception of hydrogen, was not higher than 10^{-10} Torr, and the partial pressure of hydrogen was 2×10^{-9} Torr.

To prepare the samples we used mosaic Mo-C cathodes and their geometry was such that samples with carbon concentration of 20 at.% were obtained. All samples were 60 Å thick.

The thicknesses of the superconducting film and of the coating were determined from the sputtering times. The rate of deposition of the coating, measured in special experiments, was 2 Å/min and made it possible to set the coating thickness with sufficiently high accuracy. T_c was taken to be the temperature at which the film resistance assumed the value $R = R_n/2$, where R_n is the resistance in the normal state.

The dependence of the critical temperature of the samples on the coating thickness is shown in the figure.



Dependence of critical temperature T_c on the carbon film thickness d_C. The points designated by different symbols correspond to samples obtained at different sputterings. The dark and light symbols pertain to films with different widths.

A considerable growth of T_c was observed at all coating thicknesses. For samples with coating 4 - 6 Å, the critical temperature rose 1.4°K (24%) and T_c of samples with 80-Å carbon coating rose 0.9°K (15%) compared with the film without the coating. The curve was characterized by a sharp maximum of T_c at 5 Å, a gently sloping minimum