

back is compensated by the temperature stability attained, which allows precise electrical measurements to be taken, even at temperatures higher than 4.2° K.

In conclusion, it should be mentioned that, starting from room temperature, the specimen can be cooled down to liquid helium temperature in 25 min, with a liquid helium consumption of about 2 l. However, for the α -uranium and zinc irradiation subsequently carried out by these authors a much lower cooling rate of 2 deg/min was used. The total cooling time was then ~ 3 h.

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A LOW TEMPERATURE APPARATUS FOR STUDYING E.P.R.

A. D. SHVETS, A. A. ANTIPIN, E. I. KIRILLOV, V. G. STEPANOV, and G. K. CHIRKIN

Physico-Technical Institute, Academy of Sciences, Kazan State University, Ukrainian S.S.R.

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AN apparatus has been built to study e.p.r. at a wavelength $\lambda = 8$ mm in crystals at low temperatures and the details are shown in Figure 1. The specimen 1 is stuck to the stand 2 and is in the millimetre range resonator 3. Resonator 3 (internal diameter 13 mm) is soldered at two places to the thin walled 16 mm diameter stainless steel tube 4. Resonator 3 is tuned by moving the german silver waveguides 5 (internal dimensions 5.2×2.6 mm², wall thickness 0.2 mm) in a vertical plane, together with piston 6 and coupling diaphragms 7. By means of the screw connection 8 to the flange 9 soldered to the waveguide, the piston can be mounted with coupling diaphragms of different diameters. Resonator 3, stand 2, piston 6, and the coupling diaphragms are made of silver-plated brass. The arrangement for moving the waveguide consists of a micrometer screw 11 fastened to a fixed pillar 10, the nut 12, lock-nut 13, ball 14, sleeve 15, pin 16, cylinder 17, and bellow 18. The mode of operation is clear from the Figure.

Temperatures below 1.3° K are obtained in the present apparatus as described by Esel'son et al.¹

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When the temperature of the outer bath 19 is 1.3° K (produced by pumping on liquid helium-4 with a rotary pump) gaseous helium-3 from cylinder 20 is condensed in tube 4 and fills the metal Dewar 22 (inner diameter 20 mm, height 250 mm) and resonator 3 through the 2 mm diameter orifice 8. In addition to orifice 21 for filling the resonator, there are several (not shown in the Figure) holes in flange 9 and two 0.5 mm wide slits cut along the centre of opposite sides of the waveguides between flange 9 and piston 6. The helium-3 reaches the resonator from the waveguides through the coupling diaphragm. After the condensation is finished the 7 mm diameter bellows valve 23 is opened and the charcoal adsorption pump 24 is brought into operation (a copper cylinder, 72 mm diameter, 240 mm high, containing 100 g BAU charcoal) lowering the vapour pressure over the liquid helium-3 and, consequently, its temperature. The temperature is determined from the helium-3 vapour pressure, measured on a short U-tube manometer and two McLeod gauges.

The minimum temperature of 0.314° K is obtained 10 min after the start of pumping and when ~ 3.5 l. of gaseous helium-3 ($p = 760$ torr, $T = 293^{\circ}$ K) is condensed, stays constant for not less than 3.5 h.