... l. of helium-3) and a sufficient pumping rate for ...ent conditions. For meeting the first requirement we ...ed the quantity of zeolite. For the second require... we tried to provide better thermal contact between ... and zeolite grains, and easier access of the gas to the ... by spreading it thinly over a large surface.

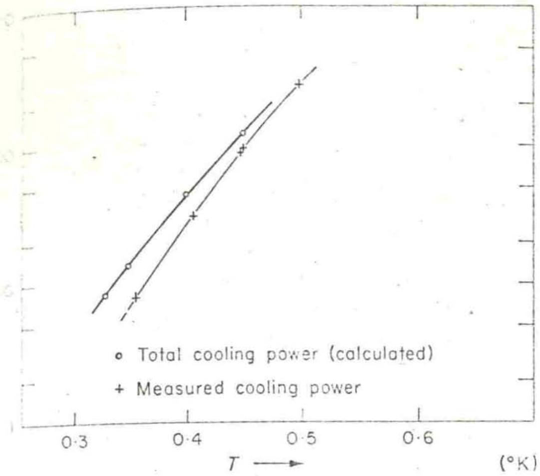

Figure 5. Performance of helium-3 cryostat

The cryopump used is a stainless steel tube of 16 mm ...ameter with a copper tube extension of the same ...ameter and 30 cm long. A central channel of copper ...re grating, 11 mm across, forms an annular space ...ntaining 15 g zeolite. In order to reduce the heat intake ... the adsorbant by radiation from outside and facilitate ...ling of the pumped gas, a radiation trap was mounted ... the tube.

The cryopump is submerged in a helium-4 storage ...nk which is raised and lowered by means of a hoisting ...rriage. At the start of a test the helium-3 tanks (0·5 to ... l. s.t.p.) are emptied by means of the cryopump. The ...orage tank is then lowered, the helium-3 desorbed and ... condenses on contact with the helium-4 bath at 1·2° K ... its vapour pressure of 20 mm for this temperature.

After closing the pump valve the storage tank is ...ised, the cryopump quickly reaches thermal equilibrium and the liquefied helium-3 can then be pumped, using a valve for regulating the bath pressure.

The measured pumping rate of the new pump is of the order of 1·7 l./s for a capacity of over 3 l. of helium-3. We reached 0·33° K, at which temperature helium-3 has a vapour pressure of 5 μ. With 2·5 l. of helium-3 the test will last just as long as the helium-4 bath. For measuring the cooling power of the arrangement (Figure 5) we passed into a heating resistor connected to the block a known amount of energy sufficient, at equilibrium, to offset the heat dissipated by vaporization of the helium-3.

During these tests the temperature of the block was measured by means of a carbon resistor calibrated at the laboratory. We also plotted the total theoretical power curve on the basis of the pumping rates of the cryopump (1·7 l./s) and circuits (4 l./s), disregarding the thermal losses.

Conclusion

The preliminary tests have shown the effectiveness of cryosorption pumping of helium-3 at 4·2° K and resulted in a cryostat of simple design and operation. By means of thermal contact and rapid recondensation of the adsorbed gas (the desorption–condensation–cooling process takes less than 10 min) successive cycles for cooling samples of high thermal capacity can be produced with small quantities of helium-3.

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