



Fig. 3 The change in resistance, ΔR , of a 30 per cent rhodium-platinum resistor, in the annealed and unannealed condition, was determined in the temperature range 1.9 to 4.2K

The stability of resistors from run to run was good. The values of two resistors subjected to many temperature cycles between 2K and 300K changed by less than 4 ppm over a period of 18 months.

Linked with the requirement of low temperature coefficient of resistance is that of load coefficient. If a resistor is to be operated over a range of currents, the temperature rise due to self-heating must not cause the resistor to change significantly from its calibrated value. The load coefficient, which expresses the resistance change in parts per million per watt of power dissipated in the

resistor, can be minimised (i) by operating near the resistance-temperature minimum, and also (ii) by promoting the removal of heat from the resistance wire. Liquid helium becomes superfluid below 2.17K, ensuring highly effective cooling of the wire, and when the superfluid state exists at the resistance minimum, as in the example shown in Figure 3, the load coefficient can in principle be very small—of the order of 1 part per million per watt. Resistors tested under working conditions showed no measurable change, within ± 0.01 ppm, at currents up to 20 mA.

Conclusion

Rhodium-platinum wire-wound resistors of relatively simple construction offer a high degree of stability for precise electrical measurements in liquid helium at temperatures close to 2K. Further work will be directed to reducing the overall dimensions of the resistors, and extending the temperature range of the resistance minimum towards 4.2K.

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References

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Gauges for Ammonia Oxidation Plants

A new booklet, with the above title, has been produced by Johnson Matthey Metals, and is freely available to those with an active interest in this subject.

The catalytic oxidation of ammonia to produce nitric acid—most of which is subsequently used for the manufacture of fertilisers, or explosives for the mining and quarrying industry—is generally carried out over rhodium-platinum gauzes. These suffer a loss in weight as the gas stream flows

through them, but this loss can be significantly reduced if gold-palladium catchment gauzes are positioned downstream.

The illustrated booklet, which is printed in French, German and Spanish, as well as in English, contains technical information about both types of gauze, and also about the related services—especially platinum recovery—which Johnson Matthey Metals provide to enable their customers to utilise the gauzes in the most advantageous manner.