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Precision Temperature Measurements

EFFECTS OF AIR QUENCHING AND STRESSING ON PLATINUM:RHODIUM-PLATINUM THERMOCOUPLES

In 1979 the Ottawa laboratories of the Physics Division of the National Research Council of Canada issued the first two volumes of a report on the use of platinum:10 per cent rhodium-platinum thermocouples for measuring temperatures with a precision of at least 0.1°C (1).

A third volume has now been published, examining in considerable detail "the thermoelectric effects of mild quenching and deformation that might be experienced by the individual elements during the preparation and use of standard thermocouples" (2).

The earlier report specified that for precision use the couples (usually 186 cm long) should, before use, be electrically annealed in air at 1300°C for 1 to 10 hours and, after cooling in air, be annealed for 1 hour at 450°C to eliminate quenched-in vacancies and finally, after sheathing, be given a recovery and equilibrium anneal at 450°C overnight.

After this elaborate pre-treatment it is not easy to visualise why a competent experimenter intent on using the couple to measure

temperatures with a precision of $\pm 0.1^{\circ}\text{C}$, should air-quench either elements from temperatures between 800 and 1300°C or should stretch the wires to near their breaking point or twist the ends into tight spirals.

However, the present volume examines conscientiously in meticulous detail the effects of such mistreatments. It provides a tribute to the care and thoroughness with which this study of the factors affecting the readings of this thermocouple has been conducted. It may be reassuring to industrial users to note that the greatest damage recorded by any of these treatments amounts to no more than a reduction in temperature reading of 0.8°C .

J. C. C.

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- 2 Part III, Effect of Metal Quenching and Deformation on Standard Thermocouples, October 1983 (APH 2553/NRCC 17409)