

HIGH SENSITIVITIES CHROMEL (Ni 90, Cr 10)/AU + 0.03 at % Fe AND Cu/AU + 0.03 at % Fe THERMOCOUPLES FOR MEASURING CRYOGENIC TO AMBIENT TEMPERATURES.

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ABSTRACT

Thermal e.m. fs of two thermocouples designed, Chromel (Ni 90, Cr 10) / Au + 0.03 at % Fe and Cu/Au + 0.03 at % Fe were noted after small intervals of temperatures between 77.3 (LN₂) and 300 K by a self-designed Cryostat and Precision Potentiometer. The sensitivity and thermal e.m.f. increases with the decrease of temperature. Chromel/ Au + 0.03 at % Fe was more sensitive than Cu/Au + 0.03 at % Fe. Thermocouples were found fairly reproducible and were calibrated against CLTS (Cryogenic Linear Temperature Sensor) thermometer.

1. INTRODUCTION

Characteristics which make (1) a thermocouple suitable as a general purpose thermometer include adequate sensitivity over a wide temperature range, stability against physical and chemical change under various conditions of use and over extended periods of time, availability in a selection of wire diameters and moderate cost.

The reproducibility and general accuracy of thermoelectric thermometry depend (2) largely on the homogeneity—both chemical and physical—of the metals in the circuit.

It has been shown (3) that the alloys with small addition of 3d transition metals have high thermal e. m. fs at low temperatures, due to the kondo effect. An essential condition for occurrence of a high thermal e.m.f. is the absence of other impurities in the alloy, depressing the contribution to the e.m.f. from the

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