FIG. 11. Corrections for Pt–Pt10Rh thermocouples operating with a seal temperature of 20°C. The dashed lines indicate the upper limits of the experimentally explored region.

the corrections which would be appropriate if the pressure seal where the thermocouple wires exited from the high-pressure region remained at 20°C.

Estimates of the uncertainties of these thermocouple corrections were made based on: (1) the pressure and temperature uncertainties, (2) the slopes and relative magnitudes of the various fit voltage surfaces, (3) the number and distribution of data points, and (4) the scatter in the observed voltages. The final uncertainties are ± (10%+10 μV) for Pt–Pt10Rh and ± (20%+20 μV) for Chromel–Alumel. They have been indicated by error bars in Figs. 11 and 12. They are applicable only within the experimentally explored region. Although these plotted uncertainties appear fairly large, they contribute only about ±0.2% to the uncertainty of a final temperature measurement.

Surfaces of the same form as above were fit to the values shown in Figs. 11 and 12. Table II gives the coefficients of these surfaces which may be used to generate tables of thermocouple corrections. The deviations of these fits contribute negligibly to the correction uncertainty. In the experimentally explored region, up to 35 kbar and 1000°C, the maximum deviations from the values shown in Figs. 11 and 12 are 1.7 μV for Pt–Pt10Rh and 8 μV for Chromel–Alumel. Also included are the coefficients for the individual thermoelements.
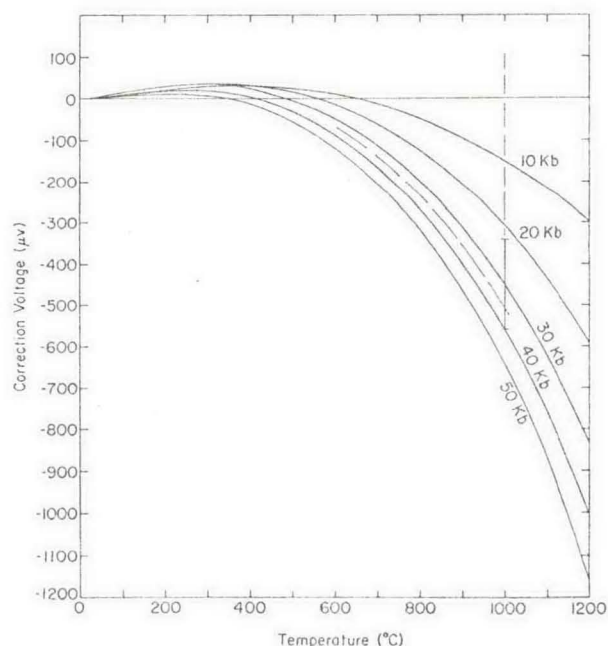

FIG. 12. Corrections for Chromel–Alumel thermocouples operating with a seal temperature of 20°C. The dashed lines indicate the upper limits of the experimentally explored region.
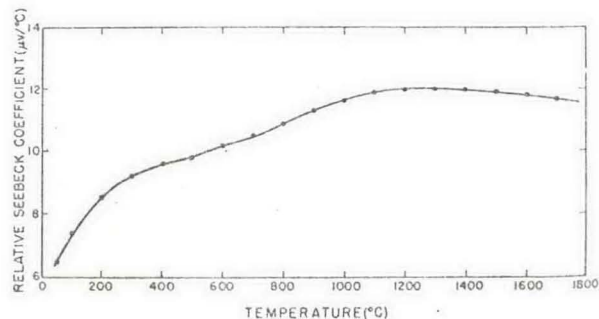

FIG. 13. Relative Seebeck coefficient of Pt–Pt10Rh at 1 atm as a function of temperature.