

Pressure dependence of the emf of thermocouples: Comparison of W-Re and Pt-Rh thermocouples with P-measurements by in situ X-ray

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One of the serious problems in high-temperature-high-pressure studies is the pressure dependence of the emf of thermocouples. When two different kinds of thermocouples exposed to identical temperatures and elevated pressures, there is a discrepancy in temperature reading. We measured the temperature discrepancy and the pressure using the in situ X-ray observations. Experiments were performed using a DIA-type, cubic-anvil apparatus. Experimental results were obtained in the pressure and temperature ranges of $P=1.8-10.6\text{GPa}$ and $T=26-1000\text{C}$. W5%Re/W26%Re thermocouples recorded 12 degree higher temperature than Pt/Pt13% Rh thermocouples at 10.6GPa and 1000C.