P7.2.5

Termoelektryczność

P7.2.5.1
Zjawisko Seebecka: Określenie napięcia termoelektrycznego w funkcji zmiennej temperatury

Zjawisko Seebecka: Określenie napięcia termoelektrycznego w funkcji różnej temperatury (P7.2.5.1_a)

Nr kat.	Opis	P 7. 2. 5. 1 (a)
557 01	Termopara, prosta, zestaw 3 szt.	1
590 011	Wtyczka z zamocowaniem	2
532 13	Mikrowoltomierz	1
382 34	Termometr, -10 ... +110 °C/0.2 K	1
666 767	Płyta grzewcza	1
664 104	Zlewka, 400 ml, szeroka	1

When two metal wires with different Fermi energies E_F touch, electrons move from one to the other. The metal with the lower electronic work function W_A emits electrons and becomes positive. The transfer does not stop until the contact voltage

$$U = \frac{W_{A,1} - W_{A,2}}{e}$$

e: elementary charge

is reached. If the wires are brought together in such a way that they touch at both ends, and if the two contact points have a temperature differential $T = T_1 - T_2$, an electrical potential, the thermoelectric voltage

$$U_T = U(T_1) - U(T_2)$$

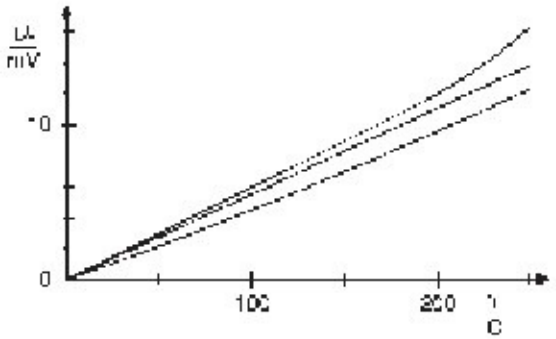
is generated. Here, the differential thermoelectric voltage

$$\alpha = \frac{dU_T}{dT}$$

depends on the combination of the two metals.
In the experiment P7.2.5.1, the thermoelectric voltage U_T is measured as a function of the temperature differential T between the two contact points for thermocouples with the combinations iron/constantan, copper/constantan and chrome-nickel/constantan. One contact point is continuously maintained at room temperature, while the other is heated in a water bath. The differential thermoelectric voltage is determined by applying a best-fit straight line

$$U_T = \alpha \cdot T$$

to the measured values.



Napięcie termoelektryczne jako funkcja temperatury. Na górze: chrom-nikiel/konstantan, W środku: żelazo/konstantan, na dole: miedź/konstantan