

3.5.02-00 Thermal and electrical conductivity of metals



What you can learn about ...

- Electrical conductivity
- Wiedmann-Franz law
- Lorenz number
- Diffusion
- Temperature gradient
- Heat transport
- Specific heat
- Four-point measurement

Principle:

The thermal conductivity of copper and aluminium is determined in a constant temperature gradient from the calorimetrically measured heat flow.

The electrical conductivity of copper and aluminium is determined, and the Wiedmann-Franz law is tested.

Tasks:

1. Determine the heat capacity of the calorimeter in a mixture experiment as a preliminary test. Measure the calefaction of water at a temperature of 0°C in a calorimeter due to the action of the ambient temperature as a function of time.
2. To begin with, establish a constant temperature gradient in a metal rod with the use of two heat reservoirs (boiling water and ice water) After removing the pieces of ice, measure the calefaction of the cold water as a function of time and determine the thermal conductivity of the metal rod.
3. Determine the electrical conductivity of copper and aluminium by recording a current-voltage characteristic line.
4. Test of the Wiedmann-Franz law.

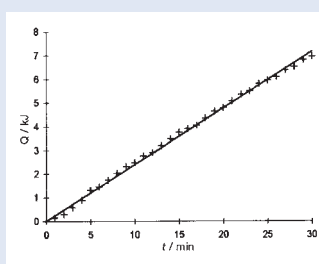


Diagram: Heat of surroundings over time.

What you need:

Calorimeter vessel, 500 ml	04401.10	1
Calorimeter vessel with heat conductivity connection	04518.10	1
Heat conductivity rod, Cu	04518.11	1
Heat conductivity rod, Al	04518.12	1
Magnetic stirrer mini, plastic (ABS)	47334.93	1
Heat conductive paste, 50 g	03747.00	1
Gauze bag	04408.00	1
Rheostats, 10 Ω, 5.7 A	06110.02	1
Immersion heater, 300 W, 220-250 VDC/AC	05947.93	1
Temperature meter digital, 4-2	13617.93	1
Temperature probe, Pt100	11759.01	1
Temperature surface probe Pt 100	11759.02	2
Stopwatch, digital, 1/100 s	03071.01	1
Tripod base -PASS-	02002.55	1
Bench clamp -PASS-	02010.00	1
Support rod -PASS-, square, l = 630 mm	02027.55	1
Support rod -PASS-, square, l = 1000 mm	02028.55	1
Universal clamp	37718.00	4
Right angle clamp -PASS-	02040.55	6
Supporting block 105 x 105 x 57 mm	02073.00	1
Beaker, DURAN®, short form, 400 ml	36014.00	1

For the electrical conductivity you need:

Multi-tap transformer with rectifier 14 VAC/12 VDC, 5 A	13533.93	1
Digital multimeter 2010	07128.00	2
Universal measuring amplifier	13626.93	1
Connecting cable, 4 mm plug, 32 A, red, l = 50 cm	07361.01	4
Connecting cable, 4 mm plug, 32 A, blue, l = 50 cm	07361.04	4

Complete Equipment Set, Manual on CD-ROM included  
 Thermal and electrical conductivity of metals P2350200