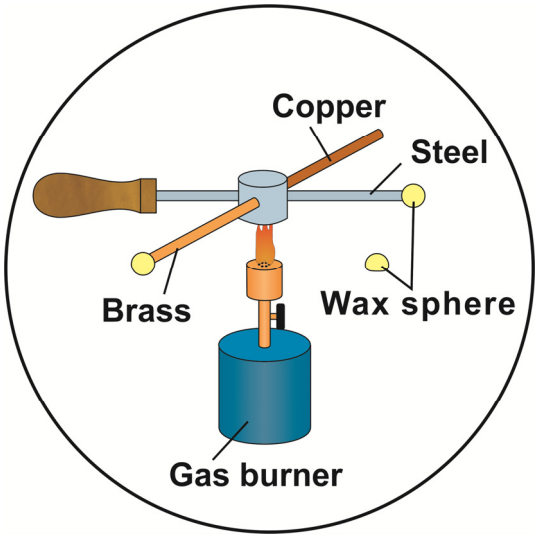
Entropy Conduction in Metals



Equipment:

cross or star made of rods with equal length and diameter of different metals (e.g. copper, brass, steel) connected with an additional rod which is used for fixation
Bunsen burner
ring stand and clamp
(small steel balls)

Chemicals:

wax

Procedure:

The cross (or star) is attached in such a way to the ring stand that the hub is above the burner. Wax spheres are stuck to the ends of the rods (or small steel balls by means of wax). Subsequently, the burner is lighted.

Observation:

The wax spheres (or steel balls) fall off one after another: first copper, then brass and finally, steel.

Explanation:

The sequence of the falling spheres reflects the different entropy conductivity σ_S of the metals.
Because the spheres fall down when the melting temperature of wax is reached the experiment rather show the temperature conductivity (thermal diffusity) $a = \sigma_S/(\rho \cdot c)$. The product of the density ρ and the specific entropy capacity c is, however, very similar for the different metals, which is why the result essentially only depend from the entropy conductivity.

Supplement:

In a simplified version of the experiment each of three pieces of chocolate is skewered with one of three very thin rods made of copper, brass and steel. The rods are then taped to the inside edge of a cup. Subsequently, the cup is filled with hot water so that the ends of the rods are covered. After a short while (approx. 30 s), the piece of chocolate in contact with the copper rod slides down in the direction of the water. Subsequently (after approx. 90 s), the one in contact with the brass rod follows. The piece in contact with the steel rod, however, does not slide down. For the experiment, milk chocolate should be used because of its lower melting point (compared to dark chocolate).

Disposal:

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