

Thermal Conduction

A piece of metal is heated at one end. There the atoms move more vehemently than in other parts of the metal. They pass on their energy to neighboring atoms. The neighbors in turn pass on their increase in energy to their neighbors. Thus the surplus energy spreads from atom to atom until the other end of the metal. The heat flows very well through aluminum and copper, moderately well through stainless steel and very bad through wood and plastic.

Convection

Matter is heated at one place, transported to another place and gives there away its heat. In the Gulf of Mexico southward of the USA the sea is heated by the sun. This warm water flows across the Atlantic Ocean towards northern Europe and warms the countries there.

Thermal Radiation

Hot bodies glow red, orange, yellow, white or bluish white. They send out light and invisible thermal radiation. When you stand near a fire you can feel the heat that is given away from the fire. The sun sends light and heat through the empty space towards us, and it arrives at the earth with more than 1300 W per m².

The emission of the radiation depends on the radiating surface and on its temperature. Black surfaces send out most of the energy, that is produced. A black body at room temperature (about 300 K) emits about 46 mW/cm². If 100 % of the energy is emitted, the emitted energy per second P increases extremely strongly with the Kelvin/Temperature T . $2 \cdot T$ gives $16 \cdot P$, $3 \cdot T$ gives $81 \cdot P$ and $10 \cdot T$ gives $10\,000 \cdot P$. $P = \sigma \cdot T^4$. If a body is heated, its temperature T increases so much that it emits as much as it receives.

White surfaces emit much less, and surfaces like mirrors emit extremely little power.

Atoms and molecules absorb and emit only certain colors.

Transport of Latent Heat

The sun shines on the sea and other water surfaces, and energy from the sun causes water molecules to leave the water. These water molecules are the invisible water vapor. This water vapor is blown by winds to other regions. When the air becomes colder, water vapor forms water droplets and raindrops. The energy taken up by the water to produce water vapor is then given away to the surroundings by the water molecules, who form a liquid. In a thunderstorm, this released energy at condensation increases the temperature of the air and causes this air to climb upwards. As the temperature decreases with altitude in the lowest kilometers of the atmosphere, the ascending air becomes colder and more water vapor condenses. That in turn leads to a even stronger uplift of air. Thus the latent heat drives thunderstorms and even tropical typhoons.

Transport of Chemical Energy

We transport fuel in a car until it is used by the motor. There it burns and sets heat free, that causes the motor to run. Motors running by combustion engines produce very much power per kg weight. In the living cells of animals, energy is stored as a certain molecule (ATP, Adenosintriphosphate) and sent in very tiny portions to the places, where it is needed. There an ATP molecule is transformed in an ADP (adenosindiphosphate) molecule and releases thereby its energy.