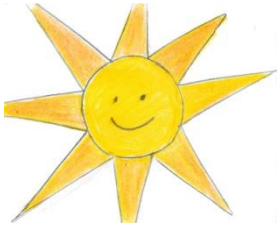
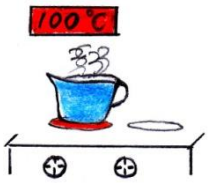
Learning environment 3 – Investigating materials classification cards
Properties 1

Find out about other properties of the materials.

	Material properties	
		
Materials:	**Melting temperature:** **The material ...melts at ...°C**	**Boiling temperature:** **The material boils at ...°C**
Iron	1,538	2,862
Copper	1,084	2,567
Aluminum	660	2,467
Table salt	801	1,413
PP	100 to 110	n/a
PET	> 250	n/a
Glass	Between 600 and 800	n/a
Cotton	No melting point	No boiling point

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Properties 2

Find out about other properties of the materials.

	Material properties	
	 Image: "SymbolMelting"	 Image: "SymbolBoiling"
Materials:	**Melting temperature: The material melts at ...°C**	**Boiling temperature: The material boils at ...°C**
Aluminum	660.32	2,467
Cotton	No melting point	No boiling point
Lead	327.4	1,751
Iron	1,538	2,862
Ethanol	-114	78.37
Glass	Between 600 and 800	No boiling point
Gold	1,064	2,970
Copper	1084.4	2,567
PET	> 250	No boiling point
PP	100 to 110	No boiling point
Table salt	801	1,413
Sulfuric acid	10	337
Silver	961.8	2,162
Water	0	100
Tin	231.9	2,687

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Properties 3

Iron

Deposits:
Iron is produced from iron ore. This iron ore is mined in high volumes in China, Brazil, Australia, Russia, Sweden, and Ukraine.
Pure iron is rarely found in nature. It is found, for example, in the Earth's core and in some meteorites.

Properties:
Iron is **flammable** only in the form of iron filings or iron powder or at very high temperatures.

Use:
Iron ore is fed into blast furnaces to produce pig iron, which, however, is hard and has poor ductility. This **pig iron** can be further processed into steel. Steels are produced by mixing molten iron with other metals and nonmetals.
Steel is used, for example, to manufacture ship hulls, railroad tracks, tools, steel girders for construction, cutlery, and stainless steel pans.
In the field of medicine, iron supplements are prescribed to patients with iron deficiency (anemia).

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Copper

Deposits:
Copper is extracted from mines as **copper ore**.
The largest deposits are located in Chile, the United States, Russia, Zambia, Canada, and Peru.

Properties:
Copper in the form of filings or powder **burns** with a green flame at high temperatures. In larger pieces, copper does not burn at normal temperatures.

Use:
Copper is a **component of brass,** bronze, and nickel silver and is used as a **coin metal**. Electrical wire, cookware, and many art objects are made from copper. Copper roofs have a long service life.

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Aluminum

Deposits:
Aluminum is the **third most abundant element in the Earth's crust.** It occurs only in **chemical compounds such as bauxite.**
It is mined in southern France, Guinea, Bosnia-Herzegovina, Hungary, Russia, India, Jamaica, and Australia.

Properties:
Aluminum is very ductile.
Only finely divided or freshly produced aluminum **burns.**

Use:
Pure aluminum is used in the **aerospace**, **automobile**, and **packaging industries**, for example, in the form of aluminum foil. It is found in scanners, heating elements of clothes irons, and coffee makers. You can also find aluminum in compounds. For example, it occurs in food dye E173 and in confectionery coatings. Experts are discussing whether this food dye presents a health risk.

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Table salt/sodium chloride

Deposits:
Table salt occurs in great quantities in nature. A distinction is made between **rock salt and sea salt.** Table salt is obtained worldwide from **salt springs and the ocean** or it is extracted in great quantities from **salt mines**, for example, in the United States, China, and Europe.

Properties:
Table salt is **not flammable.**

Use:
Table salt is used **in households** for cooking and for preserving foods. It is used as **de-icing or road salt** to clear streets of snow and ice. If you have a cold, you can gargle and rinse your nose with a table salt solution. In industry, table salt is used to **tan** leather.

Polypropylene (PP)

Deposits:
Polypropylene is a **plastic** and is produced **chemically**.

Properties:
PP is **flammable.**

Use:
PP is used in the food industry, especially as **packaging material**. The material is used in a variety of applications in medical technology because its structure is similar to that of the body's tissues. Child seats, bicycle helmets, and toys often consist of PP.
In some countries, even **bank notes are made from this plastic**.

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Polyethylene terephthalate (PET)

Deposits:
Polyethylene terephthalate is a **chemically produced plastic.**

Properties:
PET is **flammable.**

Use:
PET is used in the food packaging industry, for example, for **plastic bottles**. In addition, it is used in the textile industry to manufacture **articles of clothing**. It is also used in the production of **film material.**

Cotton

Deposits:
Cotton is the fiber of a **plant.** The plant is a member of the mallow family. The **most important cotton producers worldwide** are **China**, India, the United States, and Pakistan.

Properties:
Cotton is **flammable.**

Use:
The **main application area** of cotton is textile processing. In addition, it is also used to manufacture bandaging materials as well as **cosmetic** and hygiene products. **Fishing nets, ropes, and lines** often consist completely or partially of cotton fibers, as do tents and tarps.

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Glass

Deposits:
The most important raw material for making glass is sand.
Natural glass is formed, for example, during volcanic eruptions, meteorite impacts, or lightning strikes. This type of glass is the product of **melted** sand.

Properties:
Glass does not have a melting temperature, but a **melting range,** which is between 600 °C and 800 °C for window glass. Glass is **amorphous,** meaning that it is neither solid nor liquid.

Production and use:
Glass is a **solidified molten mass** made from different solid raw materials. For example, silica sand, various minerals, and waste glass are used to manufacture soda-lime glass. Soda-lime glass accounts for 90 percent of manufactured glass.
Glass is differentiated as **hollow glassware** and **plate glass** depending on the manufacturing process. Hollow glassware is used in **bottle** production, and plate glass is used to produce **mirrors** and **window panes.**

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Properties 4

Iron

Iron is produced from iron ore. Today, primarily 40 percent magnetic iron ore is extracted in mines in the world, while the first deposits were exposed ores. Iron ore is mined in high volumes in China, Brazil, Australia, Russia, Sweden, and Ukraine. Pure iron is rarely found in nature. It is found, for example, together with nickel in the Earth's core and in meteorites.

Iron is flammable only in the form of iron filings or iron powder or at very high temperatures.

Iron ore is fed into blast furnaces to produce pig iron, which, however, is hard and brittle. This means that the pig iron easily cracks or breaks if you want to shape it. This pig iron can be further processed into steel. Steels are alloys that are produced by mixing molten iron with other metals and nonmetals.
Steel is used, for example, to manufacture ship hulls, nails, railroad tracks, tools, steel girders for construction, cutlery, and stainless steel pans. In the field of medicine, iron supplements are prescribed to patients with iron deficiency (anemia).

Aluminum

Aluminum is the third most abundant element in the Earth's crust and almost never occurs in pure form. The most important compound from which aluminum can be extracted is called bauxite. An extremely high amount of energy is required to obtain pure aluminum from the ore. Aluminum is mined in southern France, Guinea, Hungary, Russia, India, and Australia, where the largest bauxite deposits are located.
Aluminum is very ductile. Only finely divided or freshly produced aluminum burns with a bright flame.
Pure aluminum is used in the aerospace, automobile, and packaging industries. It is found in scanners, heating elements of clothes irons, and coffee makers. However, you can also find aluminum in compounds in the food dye E173. Experts are discussing whether this food dye presents a health risk.

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Table salt/sodium chloride

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Table salt is not flammable.
Table salt is used in households for cooking and for preserving foods. It is used as de-icing or road salt to clear streets of snow and ice. If you have a cold, you can gargle and rinse your nose with a table salt solution. In industry, table salt is used to tan leather.

Polyethylene terephthalate (PET)

PET is a chemically produced, flammable plastic.
PET is needed to produce plastic bottles and to package foods. It is processed into textile fibers in order to produce wrinkle-, tear-, and weather-resistant textiles. PET is also used in the production of film material.

Copper

Copper is extracted as copper ore from underground copper mines. The largest deposits are located in Chile, the United States, Russia, Zambia, Canada, and Peru.
Copper in the form of filings or powder burns with a green flame at high temperatures. In larger pieces, copper does not burn at normal temperatures.
Copper is a component of brass, bronze, and nickel silver, which are copper alloys. Coin metals consist of such alloys, for example. Electrical wire, cookware, and many art objects are made from copper. Copper roofs have a service life of several centuries. It is particularly prized in the creation of art objects.

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Polypropylene (PP)

Polypropylene is a chemically produced, flammable plastic.
PP is used in the food industry, in particular as packaging material, and in medicine, for example, as a component of artificial joints. In addition, polypropylene plays a major role in the manufacture of child car seats and bicycle helmets.
In Australia and New Zealand, waterproof plastic banknotes are made from polypropylene. Polypropylene is excellent for building model planes and producing toys.

Glass

The most important raw material for making glass is sand. Natural glass is formed, for example, during volcanic eruptions, meteorite impacts, or lightning strikes. This type of glass is the product of melted sand. Glass does not have a fixed melting point, but rather a melting range, which is between 600 °C and 800 °C for window glass. Glass has a very special feature: It is amorphous, meaning that it is neither solid nor liquid.
Glass is a solidified molten mass made from many different solid raw materials. For example, silica sand, sodium carbonate, potash, feldspar, lime, and waste glass are used to manufacture soda-lime glass. Soda-lime glass accounts for 90 percent of manufactured glass.
Glass is differentiated as hollow glassware and plate glass depending on the manufacturing process. Hollow glassware is used in bottle production, and plate glass is used to produce mirrors and window panes.

Cotton

Cotton is the fiber of a plant belonging to the mallow family. The most important cotton producers worldwide are the People's Republic of China, India, the United States, and Pakistan. Cotton is flammable. The main application area of cotton is textile processing. In addition, it is also used to manufacture bandaging materials as well as cosmetic and hygiene products. Fishing nets, ropes, and lines previously consisted completely or partially of cotton fibers, as do tents and tarps.
Cottonseed oil occurs as a by-product during cotton production. After being further processed, it is used as cooking oil, fuel, and an ingredient in the cosmetics industry.

List of pictures
Images
"SymbolMelting" and "SymbolBoiling"

Author
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