

# Materials of technological use



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## Summary

**Do you know what materials are used to make a spaceship? And the fireworks? And the backpack that you use to go to school?**

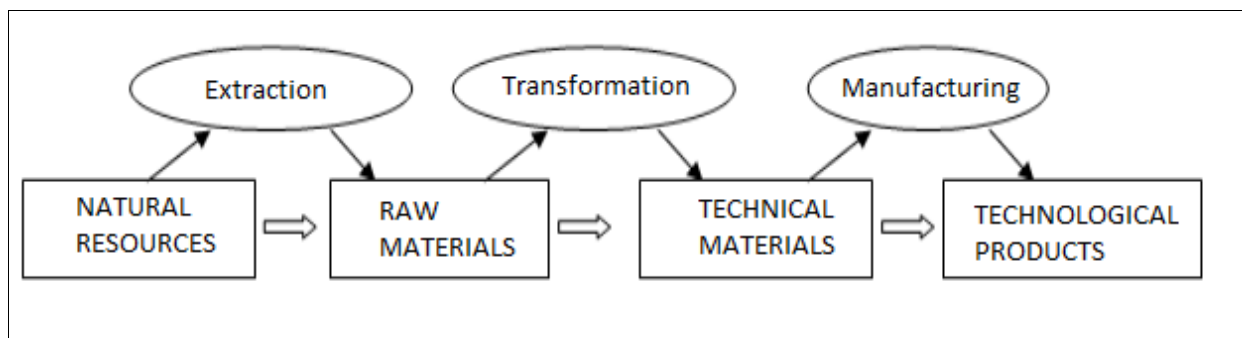
In this unit we will learn what materials are used to make technological objects that are used daily and where we obtain those materials. We will also learn the process that follows those materials, first as natural resources and raw materials in order to finally turn into materials and technological products. We will also reflect on the importance of caring for the environment with the philosophy of the three R's.

In this workshop we will practice: using various types of tools to work with wood and metals, with which you will learn to identify the workshop tools, how to use them and precautions to be taken into account to use them safely.

# 1 INTRODUCTION

Throughout history, man has utilized nature to satisfy needs and better life conditions. To do that, creating multiple technological objects that allow for better living and greater comfort. These technological objects do not occur in nature, we created them.

In this unit, we will see how man has utilized natural resources to extract raw materials that are transformed into materials of technical use and finally through manufacturing has obtained technological products. Look at the process in this diagram:



Let us now look at some examples of technological products and the process by which they become one product.

Natural resources	Raw material	Technical material	Technological product
tree	wood	plates, slats	chairs, tables ...
sheep	wool	yarn and thread	scarf, jersey ...
oil wells	petroleum	plastic	pen, folders...

## 2 NATURAL RESOURCES

**Natural resources** are those resources that are found in nature without man modifying them, but are useful and valuable because they allow the development and well-being of society.

Examples: trees, forests, mines, quarries, oil and natural gas wells, animals, etc.



Quarry, Urbasa (Navarra)

### 3 RAW MATERIALS

**Raw materials** are materials that are extracted directly from nature (natural resources) and are useful and valuable to man.

The raw materials are classified according to their origin in three large groups:

- **Raw materials of animal origin:** they are obtained from animals that are raised. Some examples of this type of raw materials are: wool (from sheep), silk (from silkworm), skins (from cow), etc.

- **Raw materials of plant or vegetable origin:** are obtained from plants, by harvesting after planting. They belong to this type: cotton (from the cotton plant), wood (from trees), flax (from the flax plant), cork (from cork bark), etc.

- **Raw materials of mineral origin:** are extracted from quarries, mines, or wells. Minerals are sand, marble, iron ore, copper ore, oil, slate, etc.



Sheepshearer, Puebla de la Sierra (Madrid)

### 4 MATERIALS OF TECHNOLOGICAL USE AND THEIR PROPERTIES

The **materials of technical use** are the materials that are obtained from the raw materials by the process called transformation and that are useful and have value for the man.

Some examples of materials of technical use are: paper (from the transformation of wood), plastic (from the transformation of petroleum), copper (from the transformation of copper ores), glass (from the transformation of sand), iron and steel (from the transformation of iron ore into blast furnaces), etc.

The different materials have different properties that make them more or less useful for one use or another.

Although there are many properties, we are only going to see a few. Some of the technical properties of the materials are as follows:

- **Hardness:** is the resistance offered by a material to be penetrated by another.
- **Toughness:** is the strength of a material at break.
- **Elasticity:** is the property that some materials have to deform when forces are applied, recovering their original form when forces end.

- **Plasticity:** is the property that some materials have to deform when forces are applied, maintaining the deformation when forces end.
- **Ductility:** is the ability of a material to be deformed forming threads or cables. Ex: copper, steel.
- **Malleability:** is the ability of a material to be deformed into sheets. Ex: gold, aluminum
- **Thermal conductivity:** a material has high thermal conductivity when it allows heat to pass through it.
- **Electrical conductivity:** A material has high electrical conductivity when it allows electric current to pass through it. Then we say that he is a conductor. Otherwise, it will be an insulator.
- **Biodegradability:** property of the material decomposition into the chemical elements that make them up by the action of biological agents (bacteria, fungi, microorganisms, etc.) in a short period of time.

## 5 CLASSIFICATION OF MATERIALS

Classifications allow us to group many elements into different groups. Classifying allows us to organize and manage knowledge. To make classifications, a criteria is required. A criteria is something that allows us to select the group to which each element belongs.

To classify materials for technical use we will use three criteria:

- According to its origin
- According to its nature
- According to its utility

It should be noted that, depending on the criteria used, different materials may be in the same group or in different groups.

### 5.1 *Classification of materials according to their origin*

If we use the criteria of origin, we find two groups:

- **Natural materials**, which are found in nature.
- **Transformed materials**, which have a chemical modification process before being used to manufacture the technical objects.

### 5.2 *Classification of materials according to their nature*

If we use the criteria of their nature, we can find the following groups:

- **Wood materials:** are obtained from the trees. They can be two types:

- Natural woods (pine, oak, beech, cherry, etc.)
- Artificial or man-made woods (plywood, chipboard, fiberboard).
- **Plastic materials:** obtained from petroleum. Ex: cellophane, PVC, etc.
- **Metallic materials:** are obtained from metallic minerals. There are two types:
  - Those containing iron or ferrous (iron, steel and cast iron)
  - Those that do not contain iron or non-ferrous (aluminum, copper, silver, etc)
- **Stone materials:** they are obtained from the minerals of the rocks. Examples: glass, plaster, cement, slate, etc.
- **Ceramic materials:** obtained by baking clay at high temperatures in an oven. Examples: ceramics and porcelain
- **Textile materials:** there are of two types:
  - Natural: they are obtained from animals and plants such as wool, silk, cotton or linen.
  - Artificial: they are obtained by industrial transformations, mainly of the petroleum, like the threads of nylon, the lycra or the polyester.

### 5.3 ***Classification of materials according to their utility***

If we use the criteria of their utility, we separate materials into the following groups:

- **Fuels:** They are used to obtain energy by burning them, such as coal or firewood.
- **Structural materials:** They are used to fabricate the resistant part of the objects. Examples are the ceramics of the bricks or the steel of the beams.
- **Binder Materials:** Used to glue objects, such as glues or cement.
- **Conductors:** They are used to allow the passage of electric current or the flow of heat, such as copper cables.
- **Insulators:** They are used to avoid the flows of electric current or heat, for example the white cork (porexpan or polyspan).

## 6 **TECHNOLOGICAL PRODUCTS**

The technological products are the objects manufactured or elaborated by men from materials of technical use to satisfy their needs and to improve their quality of life.

There are many examples we use every day: books (made with paper), bottles (made with glass or plastic), tables and chairs (manufactured with wood, steel, aluminum or plastic), etc.

Following the same classification that we have used for the materials we will have:

- **Wood products:** furniture, doors, windows, paper, cardboard, etc.
- **Plastic products:** bottles, pens, folders, containers, etc.
- **Metallic products:** machines, cars, structures, tools, etc.
- **Stone products:** glass bottles, plaster, marble tiles, etc.
- **Ceramic products:** tiles, bricks, dishes, etc.
- **Textile products:** pants, jackets, coats, clothes, bedspreads, tablecloths, curtains, upholstery. etc.

woods	Plastics	Metals
 ladder	 greenhouse	 tools
Stones	Ceramics	Textiles
 Flower pot and banister	 Plates, cup and tiles	 t-shirt and scarf

## 7 PHILOSOPHY OF THE 3 R'S

The use of technical materials can affect the environment by contaminating and depleting natural resources, but not only them, also many other materials and many consumer habits that we have today harm the environment. To avoid this, **the philosophy of the three R's** proposes three actions:

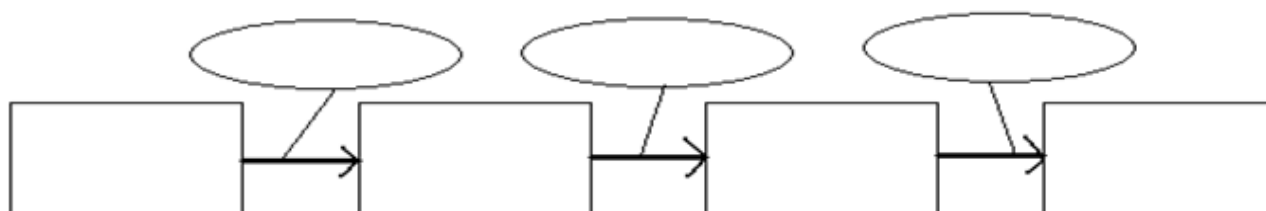
- **Reduce:** reduce the consumption of products and energy. There is no better residue than that which is not produced! Examples: reduce water and electricity consumption.
- **Recycle:** is to recover the materials that are in the discarded products to re-manufacture new products.
- **Reuse:** is to give a new utility to a product that we have discarded because it no longer serves us for its original use.

## What can we do to protect the environment?

- **Reduce:** Turn off the tap when brushing, showering instead of bathing, avoiding excessive or unnecessary packaging, avoid buying and using "throw and pull" products (such as disposable plastic bags, aluminum foil, etc.), turn off the lights when leaving the room. etc.
- **Recycle:** use recycled paper, separate the waste (paper, plastic, organic) and throw it in its corresponding container, recycle oil by taking it to a recycling point.
- **Reuse:** use both sides of the sheets of paper, make bracelets with rings of soda cans, use a can of soda as a can for pencils, etc.

## 8 ACTIVITIES

1. Complete the following process diagram of the technical materials indicating what they are becoming and what operation is carried out for that change.



2. Classify the following natural resources, raw materials, materials and technological objects in its corresponding column, so that each object coincides with the material with which it is made and this with the raw material from which it is obtained, and the raw material with its Natural resource. (Some are repeated for you to use twice!).

Sand, oil well, plywood, mine, iron, soda bottles, quarry, porcelain, quarry, crane, iron ore, tree, glass, plastic, wood, oil, vase, window glass, table, clay, Paper, forest.

Natural resources	Raw materials	Technical materials	Technological objects

3. Match the following technological products with the type of material it is made with.

<b>Material</b>	<b>Technological product</b>
Wood materials	Pipelines
	Tiles
Plastic Materials	Carpet
	Marble Tiles
Metallic Materials	Window Frame
	Soda Can
Stone Materials	Slate Roof
	Napkin
Ceramic Materials	Nail
	Chair
Textile Materials	Porcelain Cup

4. Classify the following raw materials according to their origin (animal, vegetable or mineral): cotton, silk, linen, clay, marble, furs, coal, wool, wood, sand, cork, feathers.

<b>Animal origin</b>	<b>Vegetable origin</b>	<b>Mineral origin</b>

5. Classify the materials of the following objects according to the criterion according to their origin:

Oak board, chipboard, plywood, pine beam, iron beam, copper wire, cork, white cork, cardboard, cement, granite stone, brick, white glue, hot melt glue, polyester fiber, coal, paper, aluminum profile.

6. What do you think we can do as consumers to preserve the environment? Give examples of the philosophy of the three R's.