

### Sedimentary rocks

They are rocks made of **sediment**, which is the stacking of dirt and mud over a period of time because water or air.

They cover  $\frac{3}{4}$  out of earth's surfaces

They include

- Limestone: Chemical Formula -  $\text{CaCO}_3$  (Calcium Carbonate)
- Dolomite: Chemical Formula -  $\text{CaMg}(\text{CO}_3)_2$  (Calcium Magnesium Carbonate)
- Mudstone: No specific chemical formula (composed of fine-grained mud and minerals)
- Sandstone: No specific chemical formula (composed mainly of sand-sized grains of minerals)
- Siltstone: No specific chemical formula (composed of silt-sized particles)
- Shale: No specific chemical formula (composed of clay minerals)
- Conglomerate: No specific chemical formula (composed of rounded gravel-sized particles)
- Rock Salt: Chemical Formula -  $\text{NaCl}$  (Sodium Chloride)
- Coal: No specific chemical formula (composed primarily of carbon)

### Classifying sedimentary rocks

#### Clastic sedimentary rock

They are made of fragments called **clasts**, which are the results of erosion of different rocks

They contain

- Conglomerate
- Sandstone
- Siltstone
- Mudstone
- Claystone
- Shale

They are classified according to the **size of the fragments**

Very small to be seen with the naked eye -> **clay**

Middle -> **silt**

Can be seen with the naked eye -> **sand**

Bigger than sand (small pebbles -> large boulders) -> **gravel**

Because **gravel particles** are bigger than **sand particles**, faster flows of water are needed to move them from where they originated from to where they are deposited



Sedimentary Rock	Particle Size
Claystone	Clay-sized
Siltstone	Silt-sized
Mudstone	Mix of silt and clay-sized
Shale	Small, flat chips from claystone or mudstone
Sandstone	Sand-sized
Conglomerate	Gravel-sized

### Chemical Sedimentary rock

So let's say water has took a lot of materials with it, if the water could not hold all of the materials that are dissolved in it, some of the material can come out as solids called **chemical sedimentary rocks**

It consists of materials that has precipitated from **oceans or lakes**

The most common chemical sedimentary rock is **limestone** which consists of **mineral calcite**, aka calcium carbonate with the formula ( $\text{CaCO}_3$ )

**Dolomite** is a chemical sedimentary rock consisting of the minerals

- **dolomite** (and yes, they have the same name) with a chemical formula  $\text{CaMg}(\text{CO}_3)_2$

**gypsum** ( $\text{CaSO}_4 \cdot 2\text{H}_2\text{O}$ ) and **Halite** ( $\text{NaCl}$ ) are participated out of the same solution and they are called **rock salt**, they form when the **solvent** evaporates, because the concentration of the solution increases to a point where the **rock salt** precipitate out of the solution, this happens in **dry climate areas** where intense evaporation occurs alot

**Commented [SD1]:** This is due to a process called **precipitation**, it can happen when water evaporates or when it is cooled

**Commented [SD2]:** It is formed when **calcium carbonate** is precipitated out of seawater or marine animals when they make their shells

**Commented [SD3]:** It's a substance that dissolves a solute which forms a solution, like how water is a solvent for  $\text{NaCl}$  solute forming a salt solution



## Organic sedimentary rock

They are made of **organic** materials

**Coal** is the best example, it is formed when plants in (swamps with a lot of vegetation) **die and get buried** by the remains of later plants, the compression and compaction from later plants on the material turns it into **rock**

### The life cycle of coal

1. **peat** is the first material to form, it is compacted vegetation more than it is coal, it forms when the vegetation is not buried deeply yet
2. **lignite “brown coal”** is formed when peat is faced with more time and greater compaction
3. **bituminous coal “soft coal”** is formed when lignite is faced with even more greater compaction, it's formed in the 35m mark at a 30cm
4. **anthracite “hard coal”** is the deepest buried coal, it is formed when bituminous coal is above the 35m mark

## Sedimentary Environment

sedimentary rocks are formed when sediments are deposited in various places on earth's surface

- **limestone** -> shallow ocean
- **sandstone** -> shallow ocean, beach, desert, river
- **coal** -> swamps

we can use that information to tell how was the past environment like

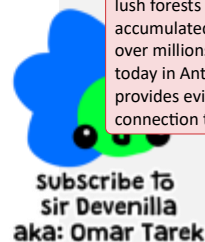
## Sedimentary Climate

- **sandstone** -> tells that it was deposited as **desert sand dunes** that got compacted into sand stone when the area was dry, which indicates a lack of vegetations
- **limestone** -> tells that it was deposited in **warm shallow oceans**, as mineral calcite was turned into sedimentary limestone because the reaction with salt water
- **coal** -> tells that it was formed in **tropical – subtropical** areas like **swamps**
- **ancient coal** -> is formed in cold places like antartica

**Commented [SD4]:** Materials that have carbon and hydrogen like  $C_2H_4O_2$

**Commented [SD5]:** کثبان رملیه

**Commented [SD6]:** Coal deposits found in Antarctica are remnants from ancient vegetation that existed when the continent was part of Gondwana, a supercontinent millions of years ago. During that time, Antarctica was situated much closer to the equator and had a milder climate, supporting lush forests and plant life. As these plants died, they accumulated and underwent a process called coalification over millions of years, forming coal deposits that we find today in Antarctica. The discovery of coal in Antarctica provides evidence of its distant history and its geological connection to other landmasses.



### How sediments become rock?

Sediments are a result of multiple generations of materials being **pressed together** over a period of time, a process called **compaction**

Water solutions from deep in Earth can filter through holes and pores between the sediment, **materials** will precipitate through the filtered solution into the sediment

These materials act like **cement** holding everything together in a process called **cementation**

These two processes will turn the materials to turn into **solid sedimentary rocks**

When the materials get glued together by the precipitated materials, it models the sedimentary rocks, here

- **clastic sediments** turn into solid rocks deep under the surface after hundreds or thousands of years, and they are not much deeper than a few meters of burials
- **chemical sediments** turn into solid rocks with very shallow burials and can form between a **few meters** to a **hundred meters** below the surface

