

Lecture # 02

PETROLOGY (2)



DEPARTMENT OF CIVIL ENGINEERING
SWEDISH COLLEGE OF ENGINEERING & TECHNOLOGY, WAH CANTT

Instructor: Engr. Imran Mehmood

Date: 14th December, 2011

SEDIMENTARY ROCKS

SEDIMENTARY ROCKS

The rocks which are derived from the consolidation of sediments of the pre-existing rocks under the influence of mechanical, chemical or organic activities of the transporting agent.

FORMATION OF SEDIMENTARY ROCKS

These rocks are formed, from the pre-existing rocks through following stages:

- Erosion of the existing rocks.
- Transportation of the eroded material
- Deposition of the material
- Transformation of the deposited material, into the thick and massive rocks.

FORMATION (Contd.....)

EROSION OF EXISTING ROCKS

The surface of the earth is exposed everywhere, to the direct and indirect actions of the physical agents. These agents continuously go on causing wear and tear of the rocks, as a result of, of which the massive rocks are converted into fine sediments. This process is known as **ROCK WEATHERING**, or erosion of the existing rocks.

FORMATION (Contd.....)

TRANSPORTATION OF ERODED MATERIAL

The material eroded by the physical agents, may or may not remain at the place of its erosion. Sometime, a part of the eroded material, manages to evade the transporting agents and hence accumulate at the site of eroding agent for a certain length of time. Another insoluble part of the eroded material, is readily transported to new places, depending upon the circumstances. The soluble substances of the eroded material are carried in solution, to far off places. If the transporting agent is running water, then the finer insoluble material carried in suspension and soluble material carried in solution, is capable of travelling variable distances, sometimes even to reach their peaceful home in the sea.

FORMATION (Contd.....)

DEPOSITION OF THE MATERIAL

The eroded material, which is transported, by the transporting agents, is deposited sooner or later depending upon the circumstances. These sediments continue to accumulate in suitable basins of sedimentation.

FORMATION (Contd.....)

TRANSFORMATION OF ERODED MATERIAL

After sometime, when the accumulation is sufficient, the loose rock particles are subjected to compaction (either due to overlying sediments or earth movements) and finally conversion into sedimentary rocks, under favorable circumstances. The process of transformation of loose rock particles, into hard and massive sedimentary rocks, is achieved through the following two ways:

1. Welding
2. Cementation

FORMATION (Contd.....)

Welding

The sediments are compacted under the influence of pressure. As a result of compaction, the water present in the sediments is squeezed out. This process invariably results in a very dense packing of sediments, which are firmly held together, as if they were subjected to welding.

FORMATION (Contd.....)

Cementation

The sediments are held together by a foreign binding or cementing materials (as the stone chips are held together by the cement mortar). This cementing material is generally supplied by the percolating waters. The most common cementing materials are carbonates of calcium and magnesium as well as oxides of iron and silicon.

It may be noted that the formation of sedimentary rocks, which involves processes of disintegration, transportation, deposition and compaction is a never-ending geological phenomena

CLASSIFICATION

The two most important classifications of sedimentary rocks are:

- CLASSIFICATION BASED ON THE GRAIN-SIZE OF THE SEDIMENTS OF THE ROCKS
- CLASSIFICATION BASED ON THE MODE OF FORMATION OR ORIGIN OF THE ROCKS

.....Base on Grain Size.....

ARGILLACEOUS

Argillaceous (Latin, Argilla=Clay) are the rocks which are made of particles having finest clay grains.

ARENACEOUS

Arenaceous (Latin, Arena = Sand) are the rocks which are made of particles having grain size between 1/10 mm to 2 mm in diameter.

REDACEOUS

Redaceous (Latin, Rudnus = Rubble) are the rocks which are made up of particles having grain size more than 2 mm in diameter.

.....Based on Mode Of Formation....

MECHANICAL ORIGIN

Rocks are formed from the pre-existing rocks by mechanical action (disintegration, i-e fracture and abrasion, transportation, deposition and consolidation) of the transporting agent, without any change in their chemical composition.

CHEMICAL ORIGIN

Rocks are formed from pre-existing rocks by chemical action (decomposition, precipitation, crystallization etc) of the transporting agent.

ORGANIC ORIGIN

Rocks are formed from the pre-existing rocks by the activities of the organisms (both plants and animals).

TEXTURE OF SEDIMENTARY ROCKS

It is defined as the mutual relationship of its component grains. It is determined by size, shape and arrangement of the component grains of rocks. Texture depends on following:

- ORIGIN OF GRAINS
- SIZE OF GRAINS
- SHAPE OF GRAINS
- PACKING OF GRAINS

Texture.....

ORIGIN OF GRAINS

A sedimentary rock of mechanical origin has coarse grains. Whereas rock of chemical origin has fine grains.

SIZE OF GRAINS

The size of rocks varies from finest to 25mm in dia. The size depend upon type of weathering, nature of the parent rocks and duration of transportation of sediments.

Texture.....

SHAPE OF GRAINS

- shape may be round, smooth or angular
- Depends on weathering, parent rock, ductility
- Round > Large abrasion & transportation
- Angularity > Less abrasion & transportation

PACKING OF GRAINS

- May be loosely or densely packed
- Loose > Compacted under lesser pressure
- Dense > Compacted under greater pressure

DESCRIPTION OF SEDIMENTARY ROCKS

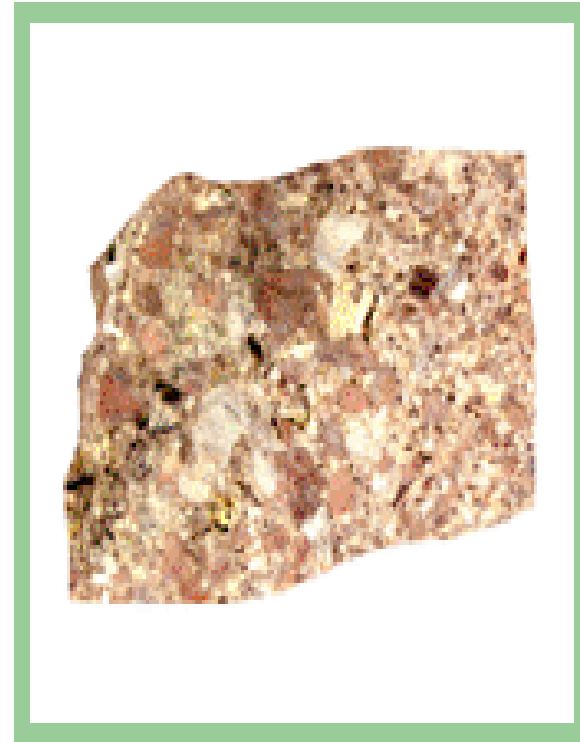
Description of sedimentary rocks depending on their mode of formation, composition and uses are as follows:

- BRECCIAS
- CONGLOMERATES
- SANDSTONE
- SHALES
- LIMESTONES

DESCRIPTION...

BRECCIAS

- Mechanically formed
- angular fragments
- sediments are heterogeneous cemented together by cement and clay
- < 2mm in size
- wide range of colors
- not used for building due to heterogeneous nature
- used in ornamental work



DESCRIPTION...

CONGLOMERATES

- Mechanically formed
- round gravels, boulders
- are heterogeneous in nature
- < 2mm in size
- hard & resistant
- used in foundation concrete and railway ballast



DESCRIPTION...

SANDSTONE

- Mechanically formed
- by cementation of particles b/w 1/10mm to 2mm dia
- in different colors depending upon cementing materials such as silica, iron oxide or carbonates
- used for all types of buildings



DESCRIPTION...

SHALE

- Mechanically formed
- by compaction of finest grains such as clays, silts or mud
- invisible under microscope
- soft & brittle
- used for brick and tile manufacture



THANK YOU

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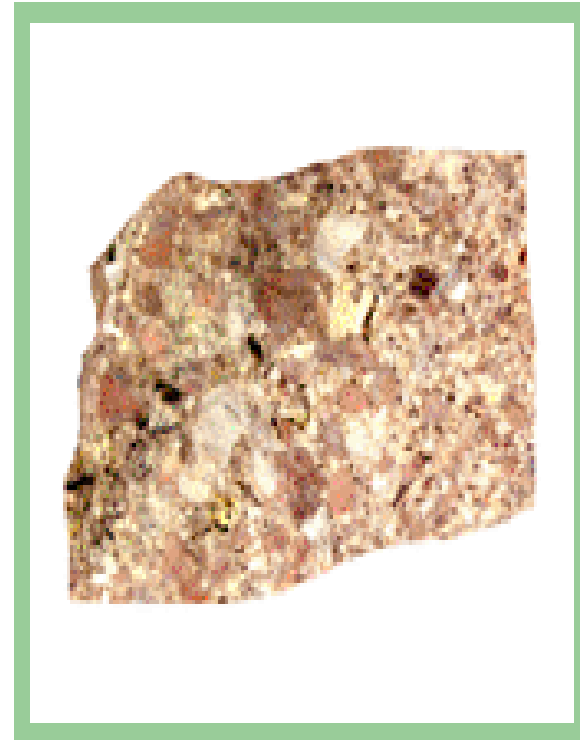
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