

Sedimentary Rock

Geologists estimate that the value of sed. R. is 5% of the outer 16 Km.

→ 75% of the exposed R. is sed. R.

• imp. of sed. R. :

* it contains Fossils which are vital tools in the study of the geologic part.

* Energy source, ex: coal

• Types of sed. R. :

a) Solid particles ^{تكون} phys. or chem. weathering
عن طريق التجوية الفيزيائية والكيميائية
→ Detrital Sed. R.

b) Soluble mat. → Chem. weathering
↳ form Chem sediments

Chem. sed. R.

← كيميائية

Detrital Sed. R.

Clay minerals and Quartz are the main constituent of most R. in this category other minerals → feldspar and mica.

The primary basis for distinguishing among various types of R (det. R.) is the particle size :

Size Range (mm)	particle Name	Sed. Name	Det. Sed. R.
> 256	Boulder		○ conglomerate
64 - 256	cobble	Gravel	or
4 - 64	pebble		◇ Breccia
2 - 4	Granule		Angular pieces
$\frac{1}{16} - 2$	Sand	Sand	sandstone
$\frac{1}{256} - \frac{1}{16}$	silt	} mud	shale
$< \frac{1}{256}$	clay		or mudstone
			or siltstone

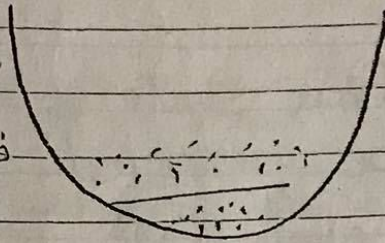
لأن صغر حجم الجزيئات في القشرة الأرضية

Very fine

Shale: tiny particles of silt and clay
• 50% of all sed. R.

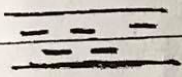
"quiet current" ^{low energy} تحتاج إلى تشكيل إلى تيار مائي هادئ

شوائبها البنية فنتكو
randomly بشكل عشوائي
structure
flocculent structure



عندما يتسرب ال silt & clay ، يتشكل طبقة
Lamina

ترسب الطبقات فوق بعضها فنترتب الطبقة السفلى
dispersed structure
& dispersed

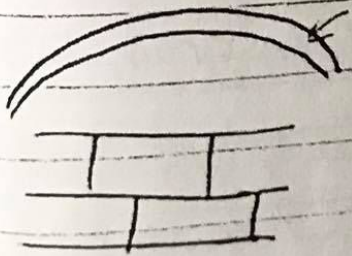


Shale is described as weak Rock
because they are poorly cemented

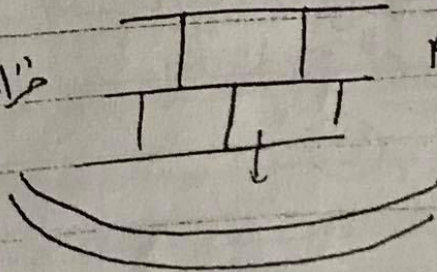
shale form barrier for petrol & under ground water

caping

Aquifer



طبقات لتجمع
المياه
الجوفية



صوان
صوان

كسر صوان قطع و كسر

للق

Shale has the ability to ~~split~~ split into thin layers (cleavage)
 * mud: breaks into chunks or blocks
 * siltstone: does not split into layers
 → composed mainly of silt and less clay.

⇒ Even shale is a weak rock it can be quarried يتحجر

الطائر البلاط وزنه طفيف
 الطوب
 pottery, tiles, brick, صناعة mixed with limestone and used in producing portland cement.

⇒ Sand stone: 20% of sed. R. "the second most abundant" sand-sized grains

well sorted (grains same size)
 or poorly sorted (mixed)

* sorting: degree of similarity in grain size of sed. R.

يحدد ان Sorting كالمليه

1) wind blown sand is better

Sorted > deposit by wave > deposit by stream

2) Distance: well sorted

well sorted

Sorting, roundness, mineral composition

Feldspar -> phys.

give an idea about the history of the sand.

Angular

Names of sand

* Quartz sand stone: SiO_2 Quartz

* Arkose: if sand contain appreciable amount of feldspar, phys. w.

* Gray wacke: contain Quartz, feldspar, dark in color, contain Rock fragments and angular grains "poorly sorted"

Conglomerate: Composed primarily of large rounded gravel with sand and clay

Breccia: composed of large angular gravel with mud and clay (travel short dist.)

→ Chemical sedimentary R:

In contrast to detrital R [formed the solid product of weathering] chemical sediments derive from material that is carried in solution to lakes and seas, then this material precipitates to form chemical sediments which become R such as limestone, chert, rock salt.

precipitation occur by two ways; EX: salt

a) Inorganic processes such as evaporation and chemical activity

b) Organic - process of water dwelling organism [biochemical origin]

سماكة الجدران، نكهة، رائحة، لون، شكل، تركيب، خواص
"Coquina" جو العظام shells

* Limestone:

it represent 10% of the total volume of all sedimentary R, and it is the most abundant chemical sedimentary R. It composed mainly of mineral calcite ($CaCO_3$) and it is formed either by inorganic process or biochemical process, but all have the same mineral composition. The one having marine biochemical origin is the most common.

EX. of biochemical origin limestone is Coquina [coarse R. composed of poorly cemented shells & shell fragments]

→ chalk is a soft porous R

EX. of inorganic limestone: form when chemical changes at high water temperatures increase the concentration of calcium carbonate to the point that it precipitates. exp. of this is Travertine

type of limestone seen in caves. another exp. is oolitic limestone (R. composed of small spherical grains formed in shallow marine water)

* Dolomite: $CaMg(CO_3)_2$

it is a rock very similar to limestone, it is composed of calcium-magnesium carbonate, some geologist refer to it as dolostone

→ Dolomite can be formed: a) direct precipitation from sea water

b) most originates when magnesium in seawater replaces some of the calcium in limestone.

most of Dolomite are ancient rocks [replace need long time to occur.]

* chert:

it is a name used for a variety of very dense, hard R. made of microcrystalline silica (SiO_2). - 30

Ex:

Flint: has dark color results from organic matter it contains.

Jasper: has a red bright col. from iron-oxide it contains.

Agate: is a banded form of chert.

Chert deposits are found in one of two situations:

a) irregularly shaped nodules in lime stone and as layers of R. Source of the beds is a bio-chemical sediments (some organisms in water produce glass-like silica skeletons), it is from their remains that most chert beds are believed to originate.

b) some chert beds occur from lava flow and layers of volcanic ash.

* Evaporates: Inorganic chemical sed. R (halite, gypsum R). Consist of intergrown crystals, resembling igneous R. Turning sediments into sedimentary R. by a process of lithification which includes:

a) Compaction: which is most significant in fine grained sedimentary R. like shale (reduction in volume can reach to 40%).

b) Cementation: a process by which sediments are converted to sedimentary R. the cementing materials are carried in solution by water, then precipitate to fill the pores between grains and joints the particles. Cementing material may be calcite which react with dilute hydrochloric acid.

* silica: which is the hardest cement and thus produce the hardest sedimentary R.

* iron-oxide: which give an orange or dark red col. for sedimentary R.

تقسم الصخور الرسوبية من حيث ال texture إلى قسمين :

Texture

clastic

when Rock consist of discrete fragments and particle

ex. det. Rocks
coquina

non clastic

Rock in which minerals form a pattern of interlocking crystal

'organic' من النباتات لا ينشأ من تفسيد

ex. coal, gypsum, chert, halite

(B)

Features of sedimentary R.

it formed at the earth surface as layer upon layer (strata or bed) of sediments accumulates, each layer record the nature of the environ at the time sediments was deposit.

strata are the most characteristic features of sedi. R, each strata is unique, each layer different from the other in (texture, composition and thickness) which reflect the different conditions under which each layer was deposit.

strata are separated by a flat surface (bedding planes) along which rock tend to separate or break, each bedding planes marks the end of one deposit and beginning of another.

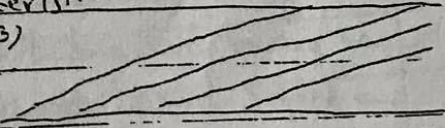
these planes are created due to the change in grain size or composition of sediments, or if the deposition is stopped for some time.

So studying of sedi. R give an idea about the past environment under which these R was performed. for EX Mud cracks indicate that the sediment in which they formed was alternately wet and dry.

which may happen in a shallow lakes

Some layers in the bed may be inclined at a steep angle to the horizontal

we call this cross bedding, it is characteristic of lithified river deposit and sand dune



Fossils: the presence the evidence or remains of prehistoric life, which are usually found in sedi. R. fossils are used to correlate R of similar age but different places

Formation of natural gas & oil associated with S.R.

Sedimentary R is a source of non metallic Mineral: (importance of S.R) non metallic resources: earth materials that are not used as fuel or processed for metals, it is divided into two groups:

a) Building materials

b) Industrial minerals

Some of non-met. are found in both group like limestone, it is used

Handwritten notes in Arabic on the left margin, including a small diagram of a grid.

as crushed stone and building stone, also it is used in cement & steel ind. and used in agriculture to neutralize acidic soil. other important building mat.: Agg. (gravel sand, crushed rock), Gypsum for plastering, Clay for tile and bricks and cement (lime stone & shale). Cement + Agg. → Concrete which is essential for all constructions. ~~and~~ ^{steel} Ex. of industrial mineral are: lime stone and fluorite (steel ind.), Halite

Non-metallic Resources

(table salt)

① Energy resources from sedimentary R:

primary fuels are: Coal, petroleum and natural gas → (fossil fuels) which burning we are using energy from the sun that was received and stored by plants. Coal: it is made of organic matter, has plant structures (such as: leaves, wood) that have been chemically altered (buried for millions of years)

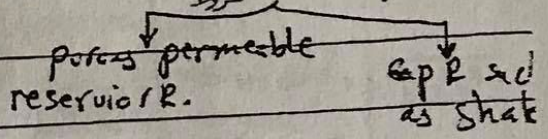
Coal is formed as follow:

accumulation of large quantities of plant remains in a swampy area (has little oxygen) → bacteria attack ~~the~~ and partly decompose the organic material and release oxygen and hydrogen → 50% carbon increase → a layer of peat (Soft brown mat. in which plant structures still recognized) → shall burial peat change to lignite (soft brown coal) → burial increase (high temperature & pressure) so chemical reactions within the plant materials and yield water and organic gases (volatiles) → As the load increase volatiles are pressed out and the portion of fixed carbon (remaining solid mat) increase → deeper burial transforms lignite into a harder, more compacted black R. called bituminous Coal thickness of this layer is (40%) of the peat from which it formed → if sedimentary layers are subjected to deformation so more loss of volatiles and more increase in concentration of carbon this metamorphoses bituminous coal into a very hard, shiny black metamorphic rock (Anthracite).

Oil and Natural gas:

It consists of hydrocarbon compound, it is biological products derive from the remains of both plants and animals having marine origine.

Formation of petroleum begins with the accumulations of sediments (remains of plants & animals) in ocean area or near shore area (which are rich in oxygen) + biological activity → decay of organic remains before they are buried, increasing buried chem reactions transfer some of the organic matter into liquid & gas (petroleum). The formed pet is mobile → under compaction the fluids is squeezed from mud-rich layers where they originate into adjacent permeable beds (such as lime stone) usually this beds underwater (sat by water). Since pet is less dense than water so it starts moving upward until it is accumulate economically in geologic environment (oil trap).



جدول رقم (٢)
الرموز المختلفة لاصناف الصخور والتربة

التربة	صخور		نارية
	رسوبية	متحولة	
	طمس	طباشير	خشنة البلورات
	جلاميد وديش	حجر جيرى limestone	بلورات متوسطة الخشونة
	حصى	حور (طين جيرى)	دقيقة البلورات
	رمل	دملوك (كتل مختلطة)	
	طمي	بريشة (شظايا متلاحمة)	
	طين	حجر رملي	
	خث	حجر طمبي	
		حجر طيني	
		طنل (مخور صفحية)	
		صوان	
		رماد بركاني	
		جبس	
		فوسفات	

ملاحظة: يتشكل رمس
صنف التربة المركبة
بجمع شكلين نمثلا

Conglomerate
Breccia.