Welcome students.

In this module, we're going

to learn about textures,

composition, distribution.

And diagenesis of clastic rocks.

That is the argillaceous rocks.

At the end of this module,

a student will be able to know

about textures, composition,

and distribution of argillaceous rocks.

Argillaceous rocks are classified

as sedimentary rocks having

green size 1 by 256 millimeters.

And these include shale, siltstone,

claystone, and mudstone.

These rocks are classified as follows.

So here in this table we can see.

The primary unconsolidated material

That is silt, water plus mud and clay.

The consolidated equivalent

is a siltstone of salt.

And this siltstone,

when it is metamorphosed.

Quartzite is the resultant rock.

Similarly, when we have.

Water and mud.

When it is consolidated, it is

unstratified and is called a mudstone.

And this mudstone,

when it is metamorphosed, it forms.

Argillite and it lacks cleavage.

Shale is another equivalent of.

Unconsolidated water and mud.

But shale, on the other hand,

unlike mudstone is laminated.

and has fissility, and the metamorphosed

the equivalent of this is slate

So it also has second cleavage which

develops after metamorphism and

Thirdly clay of which a consolidated

equivalent is claystone and.

The metamorphosed equivalent is argillite.

The general term whole consolidated forms

of argillaceous rocks is mudrock.

These are the most abundant of the

sedimentary rocks and they constitute

about 45 to 55% of the total.

Sedimentary rock sequence.

The fine grain of this rock.

They make the.

Thin section studies difficult.

And many of these constituents are not

readily resolved under the microscope.

And therefore we determined the

mineralogy with the help of.

Chemical analysis or xray techniques.

The murder rocks are made up of

clay minerals and silt grade quartz.

Shale, it is made up of 1/3 quarts, 1/3 clay.

And one third other constituents.

Just like how we saw in the classification,

the shales are distinguished from the Mudrocks

Due to the lamination and fissility.

The lamination may be due to.

Light and dark layers.

Coarse and fine particles.

Or carbonate and silt layers

This is how we can differentiate

between the different layers.

Fine grained clastic sedimentary rocks

do not have wide range of texture and

structure like coarse clastic rocks.

The textures, commonly observed

laminations, and facility.

Fissility is property closely associated

with compassion and dewatering,

which produces an alignment of clay flakes.

So as we know, the clay minerals they are.

Aligned parallel to the surface

of the position and this.

Property is called fissility

Siltstone may also show small

scale current ripples, which we

usually observe in sandstones.

Mineral constituents.

The mineral constituents of

argillaceous rocks are clays.

Quartz and other constituents

The silicates of primary crystalline

rocks decomposed upon weathering and

when feldspars,feldspathoids, micas

Volcanic glass are decomposed.

One of the main product of their

weathering are Clay minerals

the Quartz which found in the

argillaceous rocks is mostly of

silt size and the other constituents

are minerals, like muscovite,

biotite, calcite. and pyrite.

The clay minerals in general are hydrous

aluminosilicates with a sheet or.

Layered structures these are.

Phyllosilicates, like Micas.

The clay minerals are made

up of two types of layers.

The first type is a

silicon oxygen tetrahedra.

And the second type of layer is an alumina

or aluminium hydroxide octahedron.

Of the Silicon, Silicon, oxygen tetrahedra.

Three out of four oxygen.

In each tetrahedra shared

with adjacent tetrahedra.

And linked together to

form a hexagonal network.

And the octahedron unit consists of.

2 sheets of closely packed oxygen.

Or hydroxyls, between which octahedrally

coordinated aluminum atom is present.

And this aluminum is in such a

way that it is equidistant from

the six oxygen or hydroxyls.

The Al. can be sometimes occupied

by other elements like Mg or Fe.

When the layers of the octahedra.

In clay minerals.

Is made up of aluminium and oxygen or

Hydroxide the aluminum site in the

Octahedon can sometimes be occupied by.

Mg or Fe and the layers of Al

In clay minerals are

referred to as gibbsite layer

The mineral gibbsite.

It consists entirely of such layers.

Similarly.

When there is Mg in place of Al

This layer is referred to as brucite.

Many times some of the atoms and ions

in the silica and alumina sheets.

replaced by other atoms anions.

For instance the.

Al in the alumina sheet is replaced.

By elements like Mg,

Fe, Ca and similar atoms.

Similarly, the Si in the silica

sheet is replaced by atoms like.

Phosphorus or. Aluminium.

This kind of substitution is called

as isomorphous substitution.

and it is responsible for the development

of different clay minerals.

The structures of clay minerals,

clay minerals

Depending on different stacking can

be grouped into three structures.

And these three structures

are two layer structure,

three layer structure,

an mixed layer structure.

We’ll first have a look

at two layer structure.

These have two layer structure.

Consisting of silica tetrahedral

sheet linked one alumina,

octahedral shared by common.

O or OH ions

Kaolinite structure does not

expand with varying water content.

and has a basal spacing

of only seven angstroms.

That is, the distance between

the one silica layer and the

next is only seven angstroms.

This is a kaolinite structure.

You can see that.

There is a silica.

Tetrahedra, and here there is.

This is the octahedral layer.

And the basal spacing is

this spacing between the two.

Layers after silica tetrahedra

and which is 7 angstroms

Next, the three layer structure in

montmorillonite the structure alumina

octahedral layer is sandwiched between

two layers of silica tetrahedra.

The three layer units of Montmorillonite

group are loosely held in the c

direction and there is a water molecule.

And cations between them.

And the basil spacing is 14 angstroms

over here on average.

But since it has the ability

to absorb water molecules,

the basil spacing changes.

And it ranges from 9.6 to

21.4 angstroms with water.

And this is the reason why it

is called expandable clay.

The vermiculite has a similar structure.

But this is less expandable and this is

because of the presence of potassium.

This binds the structure together

so tightly that the expansion

is impossible and this forms.

The illite group of clay minerals.

Chlorite also has three layer structures.

And it is held together by a Brucite layer.

This is the structure of montmorillonite.

Like I've told you. The gibbsite

layer is sandwiched in between.

The silica tetrahedral layer.

Then we have mixed layer structure.

These consisting of interleaving sheets of.

Clay minerals, for example, illite

montmorillonite or chlorite montmorillonite

Base exchange it is the exchange

of ions in solution for those of a

solid.In contact with the solid.

the solution undergoes or change in

change reciprocal to that of the solid.

And clay mineral show this

property in varying degrees.

Montmorillonite shows a large base

exchange capacity whereas Kaolinite

has slight exchange ability while

that of illite is intermediate.

Loess. Loess is a yellow to buff

colored clastic deposit composed

of silt sized quartz grains.

A distinctive feature.

Is the well sorted nature of the salt?

These are unconsolidated and unstratified

and also angular in nature.

And it is highly porous and can

stand a remarkably in vertical

slope because of angular grains.

The provider interlocking texture.

Loess deposits during the

late pleistocene and .

cover vast areas of central Europe.

Mississippi Valley region

of the United States,

Eastern South America and China.

Loess

Primarily regarded as an aeolian deposit,

but once deposited it can be

considerably modified by fluvial

reworking and pedogenesis.

We also find calcareous concretions in Loess.

This is the reference, thank you.