Hello students.

Program Bachelor of Science.

Third year subject geology semester

six course code GEC 108. Course title

Sedimentary petrology you will

be learning Unit 2 module name,

non clastic evaporites.

My name is Shritesh Mhapsekar

assistant professor,

Government College of Arts,

Science and Commerce ssanquelim.

Outline of the topic.

Introduction evaporite deposits

and depositional environments.

evaporite mineral example

and origin of evaporites..

Learning outcomes.

Students will be able to

understand evaporite deposits

and depositional environments.

Evaporite mineral example.

And origin of evaporite.

evaporites

They are mainly chemical sediments

that have been precipitated from

water following the evaporative

concentration of dissolved salts.

The principle evaporite minerals are

gypsum, anhydrite and halite.

There are many other naturally

occurring evaporite minerals,

and all of these potential and magnesium

salts are important constituents

of some marine salt deposits.

Evaporites are of great economic

importance and have a wide

range of uses and applications.

evaporite beds are in essential

components of many oil fields of the world,

commonly being the cap rocks to

carbonate reservoir rocks or affecting

structural traps through salt diapirism.

Geologically,

evaporite are useful in the

studies of paleoclimatology,

because generally they are restricted

to arid areas of low latitude

where temperatures are very high.

Relative humidity is low and

evaporation far exceeds any rainfall.

evaporite deposits and

depositional environments.

Thick evaporite succession,

in some cases reaching 1000 meter or more.

Fill many of the world's large

intracratonic sedimentary basins.

other evaporite formations interdigitate

with non-evaporitic sediments,

limestones and marls specially and

occur on stable platforms and shelves,

and in subsiding basins.

Evaporite deposited in lakes or marine embayments

May be located in pull apart

basins, intracratonic rifts

and extensional basins.

evaporite deposits are commonly cyclic.

Some consists of numerous thin evaporite

Beds typically of a gypsum,

anhydrite with little or no halite,

alternating with limestone and marl.

Two principal modes of evaporite

Depositions are recognized.

Sub aqueous precipitation from

a shallow to deep water body on a

small Lake or lagoon to large that is

Intracratonic or rift basin scale and

second one is a subaerial precipitation

taking place within sediment or in very

shallow to desiccated saline pans.

Gypsum and anhydrite rocks of gypsum and

anhydrite possesses distinctive structures

and textures and are susceptible

to replacement or recrystallization

And dissolution geological evidence

and present day occurrences show

that both gypsum and anhydrite

May be precipitated at the earth

surface subaqueously in shallow

and deep deep water, and subaerially

in coastal and inland sabkhas.

On burial to depth greater than

several 100 meters, however,

all $CaSO_4$ is present as anhydride and on

Uplifting anhydride is normally

converted to gypsum That is,

the formation of a secondary gypsum.

The many studies of gypsum anhydrite

have shown that the stable phase is

determined by the activity of water

related to salinity and temperature.

Gypsum has low relief and week birefringence

and belongs to monoclinic Crystal System.

Anhydrite has moderate birefringence,

higher relief and is orthorhombic,

and both the gypsum and anhydrite

may show a prominent cleavage.

The textures of gypsum anhydride varies considerably depending on their precipitational environment and diagenetic history.

Rock gypsum varies from coarsely crystalline to fine granular.

Gypsum may show distinct bedding planes, or it may occur as a compact body, lacking both bedding and joints.

Anhydrite is commonly finely granular, although fibrous and coarsely crystalline masses are also known.

In some places, crystals of gypsums are scattered throughout the anhydride, thereby giving the rock porphyritic appearance.

Gypsum commonly appears to be formed by hydration of anhydrite.

The process involves an increasing volume of 30 to 50%.

The resultant swelling produces notable

effects such as the enterolithic folding

of thin anhydride layers enclosed in rock

salt or other beds.

Gypsum veins are common in rock gypsum

and also in associated strata.

These veins commonly show cross fibers

and may exhibit cone in cone structure.

Large gypsum euhedra and rosettes also

occur in some muds and shales

Halite is the major component

of large evaporite basin fills,

and it is the main evaporite mineral

of modern salt lakes and saline pans.

There is much variation in the textural

and bedding features of halite,

depending largely on the

environment of deposition.

Whether it is formed subaqueously in a

Near permanent water body, or in a saline

pan subject to repeated flooding desiccation cycles.

Halite deposited in relatively deep water.

below wave base is typically well

bedded and laminated.

Schubel & Lowenstein have recognized

three stages to the

saline pan cycle, flooding

Evaporative concentration,

and desiccation.

Evaporation of the shallow water

leads to the formation of thin halite rafts

on the water surface

and bottom nucleation of halite

crystals on the settled-out rafts.

these crystal grow most rapidly

from their coigns

So developing a Chevron texture.

The sodium chloride for most halite

deposits is derived from the evaporation

of seawater, which contains a

vast reserves of sodium chloride.

Sodium chloride also can be concentrated

from fresh continental waters,

as in many salt lakes

Or derived from the dissolution and

recycling of older evaporites

The bromine content of halite

provides useful information on

the evaporation replenishment

pattern in an evaporite basin

and indicates whether the waters

were marine or continental.

Bromine does not form its own minerals during

the crystallization of salt from seawater.

Instead, it substitutes for chlorine in

halite and the other chloride minerals.

One major feature of thick halite deposits

is that commonly they are involved in

Subsurface mass flow to generate

Salt domes or diapirs.

This structure is generally are thought

to be the results of buoyancy effects,

but there are other factors involved below

A depth of around 900 to 1200 meter

halite has a lower density than other
sediments and the overburden pressure is
sufficient to cause the salt to flow.
Salt domes are important in generating
hydrocarbon traps and they also
can improve the reservoir qualities
of overlying rocks by fracturing.
Other evaporite minerals evaporation of
seawater can yield other minerals which
are rarely found in the large amounts,
but can be economically important.
In particular potassium chloride that is a
sylvite mineral is an important source of
industrial potash that occurs associated
with the halite and is interpreted as
The product of extreme
evaporation of marine waters.
However, evaporation of modern
waters results in a number of
different magnesium sulfate
minerals rather than sylvite

and this has led to suggestions

that the chemical composition of

a seawater has not been constant

over hundreds of millions of years.

Variation in the relative importance

of meteoric waters runoff from land

and hydrothermal waters from mid ocean

Ridge vents are thought to be the

reason for this variation in water chemistry,

which either favors potential chloride

or magnesium sulfate precipitation at

different times. Origin of evaporites.

All salt deposits are formed by the

evaporation of Brine,

the ultimate source of such

brines in general is seawater.

The Brine May be formed directly from

seawater by evaporation in a semi isolated

or wholly isolated arm of the sea

in an arid regions.

Brines may also form in interior

basins of arid regions,
into which waters flow that
derive their salt either from
connate waters of marine sediments
from dissolution of older salt beds, or,
as now thought by some by airborne salt
particles derived from ocean spray
transported into the continental
interior by the atmosphere.
Modern evaporite deposits accumulates
in a variety of subaerial and
shallow subaqueous environments.
Subaerial environments include both
coastal and continental sabkhas or
salt flats and interdune environments.
Shallow subaqueous environments
are present mainly in saline
coastal lakes called Salinas.
With the possible exception of
the Dead Sea in the Middle East,
no modern example of a deep

water evaporate basin exists.

However,

geologists believe that many of the thick,

laterally extensive ancient

evaporite deposits did accumulate

in the deep water basins.

So these are the references that were used.

Sedimentary rocks by Pettijohn

sedimentary petrology by Morris Tucker.

Principles of sedimentary

petrology by Sam Boggs and

Sedimentology and Stratigraphy by Gary Nichols