Quadrant II – Transcript and Related Materials

Programme: Bachelor of Science (Third Year)

Subject: Geology

Course Code: GEC 108

Course Title: Sedimentary Petrology

Unit: II

Module Name: Arenaceous Rocks

Module No: 11

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Notes:

- Arenaceous Sedimentary Rocks
- Sedimentary rocks whose individual grains are about the size of common sand.
- The average size of grains is between 0.1mm and 2mm.
- The grains may be angular or rounded. Common examples are *sandstone, grit* etc.
- Because of the predominance of quartz these rocks are rich in silica.
- They are the most commonly developed group among all the sedimentary rocks.
- They consist of grains varying between sizes of 2 and 1/16 mm and are called arenites.
- These rocks are commonly known as the sandstones, as the grains are sand size.

Sandstones:

- Sandstones form an important class of sediments.
- Excluding carbonate and volcanic sands, they form roughly one-fourth of the total sedimentary record.
- Besides, they are also important economic resources – as abrasives; as raw material in the chemical, metallurgical, and glass industries; as moulding sand, etc.
- Sands constitute important reservoirs for natural gas, oil, and artesian water. Some placer sands are a source of ore minerals and gems.
- Sandstones contribute much to our understanding of geological history.
- Their composition is a clue to provenance; their directional structures are a guide to paleo-currents; and their geometry as well as their internal structures shed light on depositional environments.
- They are formed in a different kind of depositional environments like beaches, deserts, floodplain, deltas, open ocean basin, continental shelf and slope.
- Sands may be divided into three major groups:
- Terrigenous sands – derived from sources external to the basin of deposition, and produced by weathering and breakdown of rocks.
- Carbonate sands – for the most part marine, and are primarily skeletal parts, oolites, locally derived detrital carbonate intraclasts – and produced within the basin of deposition (not by breakdown of pre-existing rocks).
- Pyroclastic sands – those formed by volcanic explosions.

Terrigenous Sands:

- There is no geomorphic area of the earth where sand is not found, except the deep ocean basins.
- Sand is continental sediment; it originates on a continent and for the most part comes to rest on the continent.
- Sands occur principally in rivers and on beaches, and to a lesser extent as dunes and in shallow near-shore seas.
- Alluvial sands are found in fans, in river channels, and on floodplains as well as on deltas of lakes and seas.
- Fluvial sands are mainly associated with stream channels.
- Shoreline sands include not only beaches, but associated offshore bars, barriers, tidal deltas, and in some cases, tidal flats.
- Eolian sands include coastal dunes and the more extensive dune fields of some desert basins.
- Marine sands are largely continental shelf sands, but some sand is carried over to the edge by turbidity currents to accumulate on the continental rise and in isolated sediment ponds in sub-sea regions.
- Not all environments of sand accumulation, however, are equally represented in the geologic record.
- Present day sands, with few exceptions, are moderately to well-sorted materials and, except where derived from older super-mature sands, are generally rather poorly rounded.
- The mineralogical and chemical composition of modern sands varies widely.
- It seems to be more dependent on size and lithology of the source area than on climate, environment and agent of deposition.

- The components of most sands are a mixture of quartz, feldspar and rock fragments, their proportion probably being governed by provenance.

Fabric of Sandstones:

- Fabric of Sandstones centers on its two components
    - the framework, i.e. the detrital fraction, (its composition and microgeometry), and
    - the voids, i.e. the spaces between the framework elements (nature and volume of the pore-filling materials).
- The framework is, by definition, formed of sand-sized materials, 1/16 to 2 mm in diameter, in tangential contact with its neighbours.
- Diagenetic processes could reduce the porosity of sandstone.
- In some sands, instead of a detrital framework with the voids partially or wholly filled with precipitated cement, the rocks exhibit a continuum of sizes from the sand range downward into silt- and clay-sized materials. These are the *wackes*, e.g. *greywacke*.
- There is no clear break in size between the coarser sand fraction and the finer materials.
- These interstitial fines are more probably a secondary or diagenetic product.
- Sandstones that contain more than 15 % of feldspars are called as *arkose*.

Structures in Sandstones:

- Sandstones serve as major rocks that preserve the structures.
- Bedding is usually obvious and sedimentary structures are common within the beds and on the bedding surfaces.
- Some of the structures seen in sandstones are current or cross bedding, ripple marks etc.