

Quadrant II – Transcript and Related Materials

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Unit: III

Module Name: Siliceous and Calcareous oozes

Module No: 18

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Notes

Siliceous and calcareous oozes

The term “Oozes” is defined as sediments which contain at least 30% skeletal remains of microorganisms

Two different types of Oozes are

1. Siliceous Ooze
2. Calcareous Ooze

Siliceous Ooze

Siliceous oozes are sediments dominantly composed dominantly of SiO_2 (silica). Two dominant groups of organisms that contribute siliceous remains: diatoms and radiolarians. Other components of siliceous oozes near

continental margins may include terrestrially derived silica particles and sponge spicules.

Diatoms

Diatoms are microscopic phytoplankton and are one of the most important primary producers in the ocean. Because they are primary producers, diatoms are found in nutrient-rich areas of the ocean especially in areas of upwelling like the polar seas. As we move from continental shelf to open ocean areas, the number of diatoms present decreases. However, Diatoms have many economic uses including in beer filters, pool filters, and optical glass.

Radiolarian

A radiolarian is a single-celled aquatic animal (zooplankton) that has a spherical, amoeba-like body with a rigid spiny skeleton of silica. Radiolarians feed on phytoplankton and thus are also more abundant in nutrient-rich water. However, radiolaria favor the equatorial upwelling zones as opposed to the polar upwelling zones. Upon death, their tests get accumulate on the seafloor and form siliceous marine sediments known as radiolarian ooze (a form of siliceous ooze).

Radiolarians first appear in the geologic record in early Cambrian time and have experienced several periods of proliferation and extinctions as recorded in the geologic record. Siliceous ooze or Biogenous sediments are seen at depth below CCD on ocean floor.

Carbonate compensation depth- CCD

The carbonate compensation depth, or CCD, is defined as the water depth at which the rate of supply of calcium carbonate from the surface is equal to the rate of dissolution. As long as the ocean floor lies above the CCD, carbonate particles will accumulate in bottom sediments, but below, there is no net accumulation of Carbonate test and only siliceous test will be present.

The sea floor near ocean ridges is typically above the CCD and carbonates are important sediment constituents, but with spreading and cooling, the sea floor descends below the CCD and deep sea clays with siliceous test become predominant. Siliceous oozes are the least common of the deep sea sediments, and make up approximately 15% of the ocean floor.

Calcareous oozes

Calcareous oozes are sediments dominantly composed dominantly of calcium carbonate (CaCO_3).

Two dominant groups of microorganisms that contribute carbonate remains: Coccolithophores (phytoplankton) and Foraminifera (zooplankton).

Coccolithophores

Coccolithophores are single-celled marine phytoplankton (microscopic plants) that live in large numbers throughout the upper layers of the ocean. Unlike any other plant in the ocean, coccolithophores secrete shells of microscopic plates made of calcite (CaCO_3). These scales, known as coccoliths, are shaped like hubcaps and are only three one-thousandths of a millimeter in diameter

Coccolithophores are part of base of the food chain and contribute vast quantities of coccoliths as sediment to large regions of the ocean basins. Coccoliths are concentrated in calcareous ooze. Coccoliths first appear in the fossil record in Triassic time. They are composed of low-magnesium calcite (the most stable form) they are easily fossilized and preserved in sedimentary rocks.

Foraminifera

Foraminifera (or forams) are a large group of single-celled zooplankton, most species have calcareous shells (or tests). Their shells are commonly divided into chambers which are added during growth and form patterns including spirals, open tubes, or hollow spheres. Depending on the species, the shell may be made of crystalline calcite, organic compounds, or sand grains and other particles cemented together. They are usually less than 1 mm in size, but some species grow much larger, reaching up to 20 cm.

The majority of foraminifera species are benthic (meaning they live on or within the seafloor sediment) while typically smaller varieties are floaters (planktonic) in the water column at various depths. Foraminifera are found in all depths of the ocean, although deep ocean varieties do not have calcareous tests. They contribute a significant volume of sediments to carbonate reefs and a major component of carbonate oozes throughout ocean basins. Over 10,000 species are recognized, both living and fossil. They first appeared in the fossil record in Cambrian time.