Marine Mineral Resources

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Marine Mineral Resources
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Occurrence

Unconsolidated Sedimentary deposits

Aggregates

Placers

Bedded Phosphorites and brine rich Sediments

Manganese, Sulfide deposits

Cobalt rich crust

Methane hydrate

Marine sediments as economic resources

Petroleum and natural gas

-the most common minerals mined from oceans

-more than one third of world crude oil from ocean

-one fourth of natural gas also from ocean

-so hundreds of billions of dollars revenue

Marine sediments as economic resources

Petroleum and natural gas

-today, oil companies are taking more risk and drilling ever deeper wells in ocean. Shallower wells are getting dry and used up. –this indicates economic potentialities of the world oceans

Marine sediments as economic resources

Unconsolidated deposits in ocean

-Oolithic sand deposits (as in Bahama Banks)

-Sand and gravels from ocean (..about 1% of world needs- about $500)

-sediments at deep sea hydrothermal vents (e.g. metal sulfides, etc)

-dissolved minerals in hot water precipitate during mixing of surrounding cold water in the seas (..Red Sea). These types of deposits are not mined yet, but values of these minerals are going up…

-Evaporites (Calcium carbonate, calcium sulfate, gypsum, sodium chlorite) at landlocked and isolated seas

Marine sediments as economic resources

-diatomaceous earth (..formed due to lithification and uplifting of deep ocean sediments with foraminifera and coccolithophore remains, e.g., White Cliffs of Dover, England), used for car polish, toothpaste, water filters etc.

Hot brines/Marine muds and metals as economic resources

The super heated seawater ejected from hydrothermal vents carries large quantities of dissolved metals and minerals.

These muds include lead, zinc, copper, iron, silver, cadmium and sulfur. These heated water cools in the cold deep water and precipitate into mounds and chimneys around the vents.

These creates a potential source for such metal/minerals (..Red sea, seamounts)

Methane hydrates as economic resources

Methane hydrates are the ice crystals containing methane on the continental slope

Such unusual hydrocarbon trapped in frozen water molecules that create a ‘cage’ in sediments

These methane contained frozen water melts at the surface releasing methane to collect

The formation mechanism of such methane hydrates is still unknown—

--but some thought considers a multistep processes that includes aerobic and anaerobic bacteria

Methane hydrates as economic resources

- Methane hydrates normally found in polar sediments and in continental slope (depth 300 to 500m)
- More than 11000 million trillion litres of methane are supposed to reserved worldwide
- Still expensive to explore, waiting for economical and convenient methods to come for exploration

Ferromanganese nodules as economic resources

Commonly formed around volcanic vents and shark teeth, contains mainly iron and manganese. Nodules are also rich in copper, nickel and cobalt which make them more valuable marine resources

Such nodules occur in all oceans but deposits are very rich in Pacific Ocean with an amount of 16 billion metric tons of cobalt and other

Still commercial recovery is not started yet due to the high cost. Countries like Japan and Korea are trying to develop the equipments for feasible deep sea nodule recovery

Magnesium dissolved in sea water

About half of the worldwide magnesium production comes from sea water

Third most abundant elements in sea water occurred as magnesium chloride and magnesium sulfate

Evaporites-Salts from sea water

Sodium chloride

Calcium carbonate

Gypsum

Magnesium rich and potassium rich compounds

Phosphorite from sea

Phosphate rock deposits are probably formed from remains of marine organisms live in the area of extensive marine upwelling (e.g., coasts of S. American Pacific Coast, California, Florida, African Atlantic coast)

Main depth ranges from 30 to 300 meters

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