

Geochemical investigation on sediments of Oman sea coasts, using Geographical Information System (GIS)

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Abstract

This study presents new data from surface sediments collected along the coasts and harbors of Oman sea (from East of Chabahar to Gavater), including grain size, mineralogy, percent of organic matter and major, minor and trace element contents. These data were obtained by wet sieving and laser particle sizing, XRD, muffle furnace, and ICP-MS methods respectively. The geological units of land are composed of calcareous marl, sandstone and conglomerate. Therefore, the natural input of selected elements (except Ca and Sr) is relatively low. From geochemical and environmental point of view, the study area can be divided into two parts: natural coasts and harbors contaminated by fishing vessels and boats. The results show sands and silty sands in coastal areas, and silts and clayey silts in the harbors consist of minerals as following sequence of increasing frequency: calcium carbonate > quartz > plagioclase > clay minerals > Fe hydroxides. Negative correlation coefficient between Al and Ca shows that the clay/calcium carbonate ratio increases from West to East. The organic matter contents of the natural sediments, mangrove sediments in Gavater bay, and harbor sediments are 2.2-3.6%, 4.5% and 2.8-

31.9% respectively. Dramatic enrichment of organic matter in harbor sediments is indicative of the influence of organic wastes from anthropogenic sewage and waste of fish entering the harbor environment. The spatial distribution of toxic trace elements shown by GIS-based geochemical maps indicates high trace element pollution in harbors. Geochemical maps also indicate increase in Be, Bi, Co, Cr, In, Nb, Ta, Ni, W, Tl, Pb, Sb and Sn in Pasabandar and Beris harbors in East and increase in Ag, Cd, Cu, Mo and Zn in Ramin harbor in West part of study area. Data obtained by Igeo values and enrichment factors (by normalization of metals to Al) confirm these results. It is, however, observed that the fine grained fraction of sediment, namely the silt – clay fraction, facilitates the uptake of metals more so than any other grain size. The most polluted sample is related to samples named B6 in Beris harbor (close to jetty) which its Pb, Sn and Sb contents are 1780, 524 and 28.7 ppm respectively. This is due to pollution by human activities related to ship repairing, greasing or fueling.

Keywords

Geochemistry; Coastal sediments; Oman Sea; Toxic elements; GIS