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SRD45-P01 Room:Poster Time:April 28 18:15-19:30

Upgradation of silica rich fluvial sands of Bangladesh: Proposals for alternate uses

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Major rivers of Bangladesh are carrying billions of tons of sediments from the Himalayan mountain range from the north, forming bars almost on every river. These bars inundate in floodwater every year, eroding some sediments as well as depositing more. Thus, almost all the rivers are getting filled with the sediment in course of time. The government of Bangladesh has undertaken a mega plan for Capital Dredging, for raising navigability of the main and important rivers across the country. But there is not enough space to keep those dredged materials. Hence, most of the time, the dredged materials are thrown only in the vicinity of dredging area. In course of very short time, those materials eventually return back to river bed with the precipitation and surface runoff. This makes wastage of time and money.

The river sediments are rich in silicate mineral, mainly quartz and feldspar, along with others, like heavy and micaceous minerals. Quartz (SiO_2) is the raw material for glass production. River sands of Bangladesh also contain some heavy minerals like magnetite, ilmenite, rutile, zircon, garnet, leucoxene, pyroxene etc., and some Mica group minerals like muscovite, biotite, chlorite etc. Industrial use of these minerals are widely accepted. Upgradation of river silica by some physical separation procedures like density, magnetic and electric separators, and chemical composition revealed from X-ray fluorescence analysis shows that 60-70% silica of river sediment can be easily enriched up to 94%. Very low amount of Fe, Al, Ca, Mg and absence of Cr and Ti indicates the probable use of this upgraded silica as glass producing sand.

For industrial use, advance research is necessary for potential use of such silica for silicon extraction or other silicon products e.g. silicon chip, if the upgradation can be reached more than 99%. The heavy and magnetic minerals associated with silica also can be used economically as by-products of the process. Mining of this sediment from the rivers will increase the navigability of the rivers. As dredging is a must in almost every river of Bangladesh, the mining will work as alternative work of dredging, saving huge amount of money to be spent for dredging. This will also lessen the risk of dangerous flood problem of the country.

Moreover, since fluvial sands has been used as earth filling materials for long time and is suitable in many technical aspects, potentiality of using such sediments for artificial islands can be thought. Japan has been implementing several artificial islands where materials like solid waste, soil from mountains are mostly used as filling materials which are not always environment friendly. Feasibility study for using bulk fluvial sand from Bangladesh as earth filling materials for future artificial islands of Japan can a better alternative. This will decrease the risk of potential environmental hazards that can be created from solid waste or hill-cutting. Use of dredged materials from Bangladesh will help decreasing environmental hazards like floods too. Economical sustainability can be achieved through such reduction of hazard risk.

Keywords: Fluvial Sand, Bangladesh, Silica, Heavy Minerals, Capital Dredging, Artificial Islands

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Iron isotopic composition of the Palaeoproterozoic Hotazel Formation in the Kalahari Manganese Field, South Africa

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Kalahari manganese deposit in the Palaeoproterozoic Hotazel Formation of Transvaal Supergroup of South Africa is the world's largest layered manganese deposit. It has alternating layers structure of three manganese rich layers and banded iron formation. This banded iron formation and manganese deposits of Hotazel Formation were formed at approximately the same time as Global Oxidation Event, which was the period of explosive growth of oxygen in Earth ' s atmosphere. In addition, the relevance of the snowball Earth event of Huronian glaciation has also been suggested from its formation age. Iron isotopes are sensitive indicators of the redox state, and it is suitable for estimating the marine environment when the banded iron formation was formed. Although a prior study on the iron isotope analysis of manganese deposits and banded iron formation of Hotazel Formation has been reported by Tsikos et al. in 2010, it is hard to say enough data is gathered.

In this study, drill core that was collected from the Kalahari manganese deposit in South Africa was subjected to iron isotope analysis with MC-ICP-MS and XRD analysis, and the results were compared with those of Tsikos et al.(2010). In isotopic analysis, δ56Fe values of drill core samples for the standard sample IRMM-14 were measured.

From the results, low δ56Fe values (not higher than -0.70 ‰) throughout the all samples were measured. When limited to manganese-rich layers, δ56Fe values are between -1.66 and -2.86 ‰. Relationship between Fe-Mn ratio and δ56Fe value showed that δ56Fe value have a tendency to drop to a lower value with the increasing abundance ratio of manganese to iron in a formation. This results are consistent with those of Tsikos et al.(2010). In other words, this results support their theory that banded iron formation has a role as a sink of heavy iron isotopes, and manganese are deposited in an environment that was rich in light iron isotopes.

Reference

Harilaos Tsikos, Alan Matthews, Yigal Erel, John M. Moore, 2010. Iron isotopes constrain biogeochemical redox cycling of iron and manganese in a Palaeoproterozoic stratified basin. Earth and Planetary Science Letters 298, 125-134. doi: 10.1016/j.epsl.2010.07.032

Keywords: iron isotope, banded iron formation, Kalahari manganese deposit