

Release of Heavy metals by resuspension of coastal sediment

† Young-chaе Song · Bakthacachallam Subha · Jung Hui Woo*

† Department of Environmental Engineering division, Korea Maritime and ocean university, Busan, Korea

* Nuclear Power Equipment Research Center, Korea Maritime and Ocean university, Busan, Korea

Abstract: *In the present study analysed the physico chemical properties and distribution of heavy metal and also analysed the changes of heavy metal distribution by resuspension and properties of heavy metal release into sea water. From the experimental result showed sediment resuspension plays an important role in the release of heavy metals in coastal environment. Heavy metal release percentage was high in different mixing time of resuspension and different amounts of sediment due to resuspension of particulate matter*

Key words : *Sequential extraction, heavy metals, sea water, sediment, suspended particulate matter*

1. Introduction

Nowadays, the aquatic environment is mainly affected from heavy metal contamination which originated from human activities are frequently detected in marine sediment. Heavy metals are distributed in many ways such as water soluble species, suspended matter and sedimentary forms (Peng et al., 2009; Huang et al., 2012). Most of the heavy metal stored in the sediment in various forms and it may not be sequestered, but at the time of shipping and dredging occur, resuspended of sediment can be potentially lead to release into the aquatic environment (Je et al., 2007). Heavy metal in the sediment is potentially water pollution source because, by the way of resuspension of heavy metal release into sea water.

Therefore the aim of present study is the analysis of physico chemical properties and distribution of heavy metals. the release properties of resuspension and the changes of heavy metal distribution by resuspension and properties of heavy metal release into sea water also investigated.

2. Materials and Methods

The sediment and seawater samples were collected from

Busan Northport (Latitude 35°7'0.96" N and Longitude 129° 3'54.85" N). The samples were collected in well cleaned acid washed container and the collected sediment and seawater were used for analysis of sequential extraction of heavy metals.

2.1 Methodology

The initial physico-chemical parameters like water content, sand, silt, clay percentage, total solids, volatile solids, pH and AVS were analysed according to the APHA (1998) method. COD_{mn} was analysed by Korean standard method. For the experimental resuspension, the collected sediment at different concentration was mixed with 1liter of seawater at different mixing time and then the samples were collected and filtered through 0.45um Whattsman filter paper and used for Heavy metal sequential extraction method (Tessier et al., 1979; Song et al., 2009).

3. Results and Discussion

3.1. Sediment characteristics

The physico chemical characteristics of the seawater and sediment are shown in Table 1. Certainly heavy metals distribution depends upon the physico chemical properties of sediment such as VS, AVS, Mn oxide

† Corresponding author: soyc@kmou.ac.kr

which is mainly affected to the heavy metal distribution. Sequential extraction of heavy metal concentration of seawater and sediment samples were shown in Figure 1 (a, b).

Table. 1. Physico chemical parameter of Busan northport

Parameters	Busan northport
Sand (%)	14.3
Silt (%)	18.6
Clay (%)	67.1
pH (at 25°C)	7.56
COD _{mn} (g/Kg)	28.4
Water content (%)	49
TS (%)	51.33
VS (%)	11.06
AVS(mg S/Kg)	246

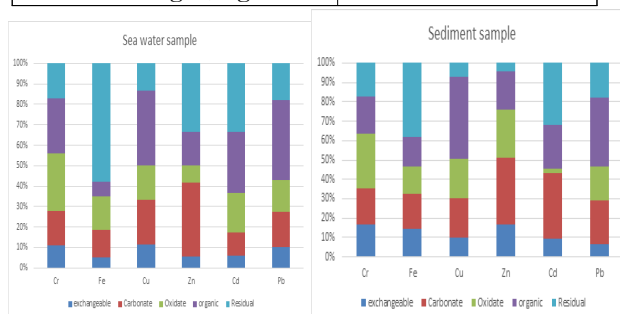


Fig 1 Sequential extraction of heavy metals (Cr, Fe, Cu, Zn, Cd and Pb) (a) sea water (b) sediment

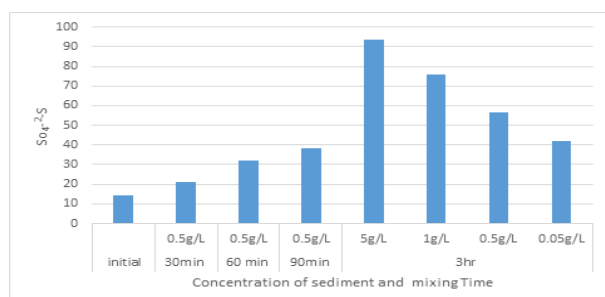


Fig. 2 Estimation of sulphate in different concentration of sediment and mixing time

In the sequential extraction of heavy metal having five fractionation such as exchangeable, carbonate, Fe-Mn oxide, organic content and residual. Mainly residual form is stabilized form and non toxic to seawater. In the sediment metals could be bound to Fe-Mn oxide, presenting in lattice of carbonates, sulfates or oxides and also complex with organic matter. The sediment minerals are crystalline lattice of soil minerals and mostly that are inactive form. Exchangeable, carbonate and Fe-Mn oxide are soluble and easily release into seawater. The organic fraction combine

with sulphide to form metal sulphide. While AVS content was high metal sulphide combined form is high. Organic fractionation solubility usually determine the mobility of heavy metals, the complexation of metal ions with insoluble organic compounds can strongly lower their mobility, whereas the formation of soluble metal complexes with dissolved organic fractionation would enhance their mobility (Peng et al., 2009). Variation of heavy metal concentrations during the short period of resuspension. seawater and sediment heavy metal concentration has been varied (Fig 1(a and b)). According to the heavy metals fractions during the short time of resuspension which can cause the oxidation of sulphide in the sediment (Huang et al., 2012). Fig 2 showed that SO_4^{2-} release rate at different concentration of sediment with different mixing time and it explained that SO_4^{2-} release rate was increase with increasing the mixing time. At the same time heavy metal concentration also varied due to SPM. Concentration of heavy metal in the upper layer of sea water is little lower than sediment. This may be due to high release content of AVS and also significant changes of heavy metal fractions were occurred.

4. Conclusion

Sediment resuspension plays an important role in the release of heavy metals in marine environment. Heavy metal release percentage was high in different mixing time of resuspension and different amounts of sediment due to resuspension of particulate matter.

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