

## RIVER SEDIMENTS AS A TRAP FOR METAL POLLUTANTS

Neda Vdović<sup>1</sup> \*, Gabriel Billon<sup>2</sup> and Jean-Luc Potdevin<sup>3</sup>

<sup>1</sup> Ruder Bošković Institute, Center for Marine and Environmental Research, Bijenička 54, 10000 Zagreb, Croatia - vdovic@irb.hr

<sup>2</sup> Université des Sciences et Technologies de Lille, Equipe de Chimie Analytique et Marine, ELICO, UMR 8013, FR CNRS 1818, 59655, Villeneuve d'Ascq cedex, France

<sup>3</sup> Université des Sciences et Technologies de Lille, Laboratoire des Processus et Bilans des Domaines Sédimentaires, UMR 8110, 59655, Villeneuve d'Ascq cedex, France

### Abstract

The efficiency of river sediments to scavenge heavy metals released from industrial waste (slag) was tested in this work. Sediments and water were sampled from the River Deûle canal (northern France). The concentrations of Pb, Cd, Zn and Cu measured in river sediments were 10 to few hundreds times higher than the background values. Slag particles were composed mostly of Al, Fe, Ca, Mn, Zn, Pb, Cd, Cu and Cr and in contact with river water they released high concentrations of Pb, Cu and Cr. When sediments were added to the river water - slag mixture, the remobilization of those metals was not so expressed. As it were, in spite of the high metal pollution level, sediments have shown the ability to adsorb metals released from slag under the conditions provided.

*Keywords : Sediments, Metals, Pollution.*

### Introduction

Metallurgical industries in northern France produce thousands tons of metals yearly and consequently, large amounts of potentially dangerous wastes. This material, improperly stored, can spread to the environment and affect the quality of the water, soil and air, and endanger the health of the population. In such cases, the role of sediments in removing toxic metals from water is of great importance.

### Experimental

Sediments and water used in experiments were sampled from the river canal, about 2 km downstream from the lead and zinc smelter, and slag was obtained from industrial waste depot. Prior to experimental work, sediments were dried under laminar flow and river water was filtered through a 0.45  $\mu$  membrane. The total concentration of metals in sediments, water and slag was measured with ICP-AES or ICP-MS.

Three sets of remobilization experiments were then performed: 40 g of (i) sediment, (ii) slag and (iii) slag/sediment mixture was dispersed in 4 dm<sup>3</sup> of river water. The rate of metal release was checked in different time intervals during 48-hour experiments. For that purpose, 10 ml of suspension was taken from the bulk suspension and concentration of metals was measured.

### Results and conclusion

The total analysis of metals in sediments, water and slag revealed high concentrations of lead, cadmium, zinc and copper. The concentrations of Pb, Cd, Zn and Cu measured in river sediments were 300, 800, 50 and 15 times higher, respectively, than the background values (1). The concentrations in water were also much higher than the world average (2), while slag contained 59, 22, 0.64 and 0.005 g kg<sup>-1</sup> of Zn, Pb, Cu and Cd, respectively.

The results of remobilization experiments showed that slag, in contact with river water, released high concentrations of Pb, Zn and Cu. Compared to the concentrations of metals released from slag, concentrations desorbed from sediments were not very high. On the contrary, sediments adsorbed some of the metals initially present in river water. When slag and sediment were mixed together, the concentrations of metals measured (*i.e.* released) were higher than those released from sediments only, but much lower than those released from slag. The results obtained (Fig. 1.) presents the case of lead) indicated that sediments, although highly polluted, seemed to be capable of adsorbing metals released from slag.

### References

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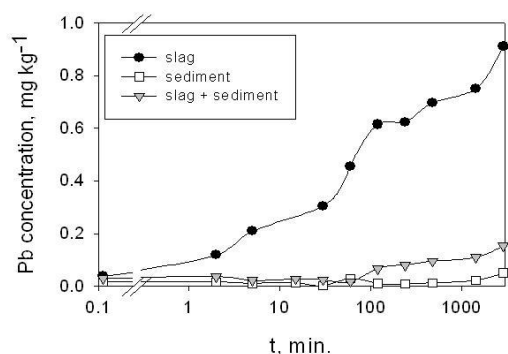


Fig. 1. Pb remobilization from slag, sediments and slag-sediments mixture.