



“Gheorghe Asachi” Technical University of Iasi, Romania



SOIL-WASHING AND THERMAL PLASMA TREATMENT FOR DECONTAMINATION OF DREDGED MARINE SEDIMENTS FROM THE MIDIA PORT – ROMANIA

Irina Catianis^{1*}, Luca Magagnini², Emanuele Ghedini³, Danilo Bettoli⁴,
Matteo Gherardi³, Paolo Sanibondi³, Constantin Ungureanu¹,
Elisa Ulazzi², Adrian Stănică¹, Alessandro Bertoni²

¹National Institute of Marine Geology and Geoecology – GeoEcoMar, 23-25 Dimitrie Onciul St.,
RO – 024053, Bucharest, Romania

²MED Ingegneria S.r.l., Via Pietro Zangheri, 16 – 48124, Ravenna, Italy

³Department of Industrial Engineering (DIN), Alma Mater Studiorum - Università di Bologna,
Via Saragozza 8 – 40123, Bologna, Italy;

⁴DIEMME – Soil Washing S.r.l., Via Fermi 6/1, 48022, Lugo, Italy

Abstract

The aim of this paper is to show the results of two methodological approaches applied for decontamination of the Midia Port dredged sediment to assess their potential reusability. Firstly, the sediment samples were defined in physical, chemical, microbiological and ecotoxicological terms. The results were compared to the limit values established by environmental regulations for dredged sediment management. Some sediment samples exposed a very high concentration of hydrocarbons; the sediments were classified in three categories on the basis of their level of organic/inorganic pollutants. The polluted sediment samples were subjected to the soil-washing treatment. The post treatment analysis revealed that the coarse silty and sandy fractions resulted unpolluted. The soil-washing induced the physical concentration of pollutants (*i.e.* C>12) in the silty-clay fraction. The wastewater from the treatment plant, once treated, showed no critical issues. After soil-washing treatment, the sediment samples were exposed to a laboratory scale 30kW RF thermal plasma source. Two types of plasma assisted treatments have been performed: the carbothermal process (to evaluate the technical feasibility of silicon extraction during material inertization) and the vitrification process (only for material inertization). Scanning electron microscopy (SEM), energy dispersion spectroscopy (EDS) withal X-ray fluorescence (XRF) and leaching tests were used to investigate the obtained material. The acquired results revealed a decontamination of the collected sediments with leaching test results below legal limits. EDS analysis showed the increment of silica (SiO₂) content by about 5-7 % after the plasma treatment and that the localized extraction of silicon by the carbothermal reduction process has been obtained.

Key words: Midia Port, plasma treatment, remediation, sediment management, soil-washing

Received: December, 2013; *Revised final:* October, 2014; *Accepted:* October, 2014