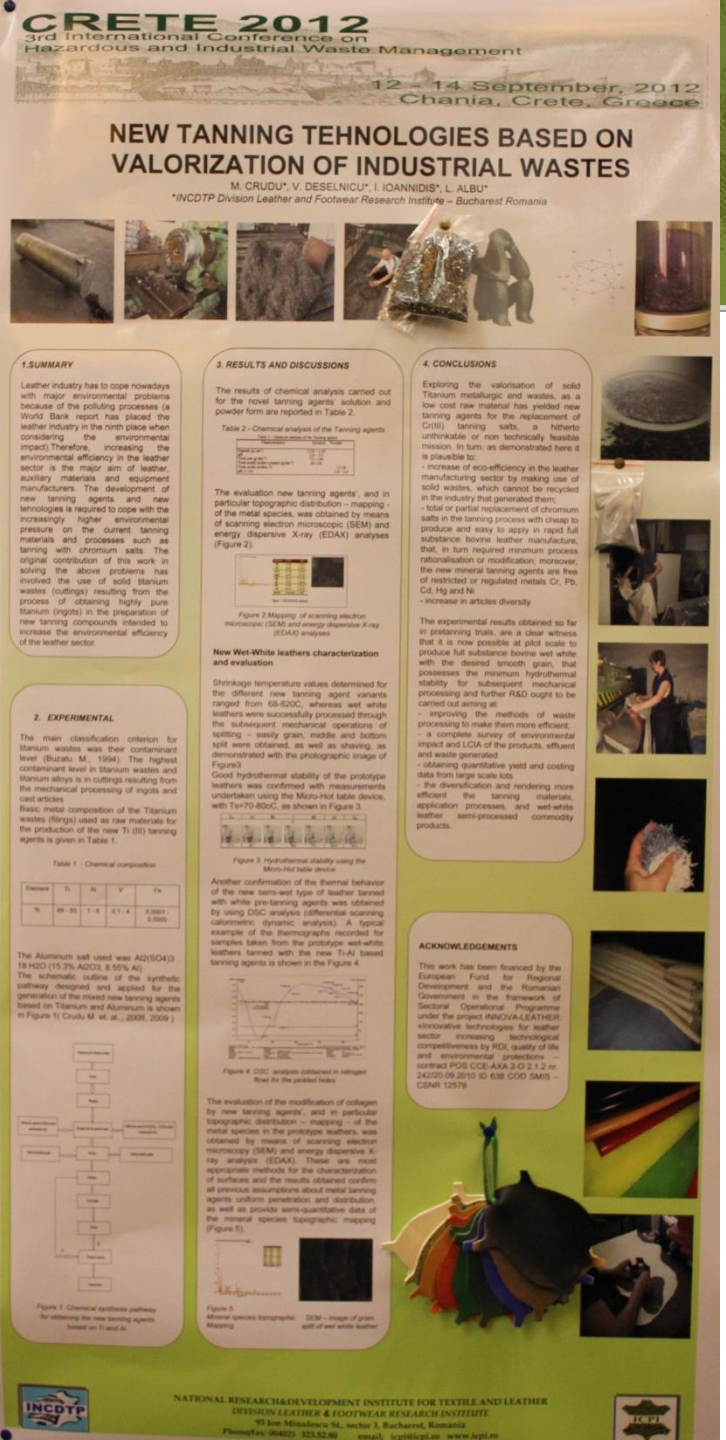

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3RD INTERNATIONAL CONFERENCE ON INDUSTRIAL AND HAZARDOUS WASTE MANAGEMENT

3rd Award

New Tanning Technologies Based on Valorization of industrial Waste

by

Crudu M., Deselnicu V., Ioannidis I., Albu R.

CRETE2012

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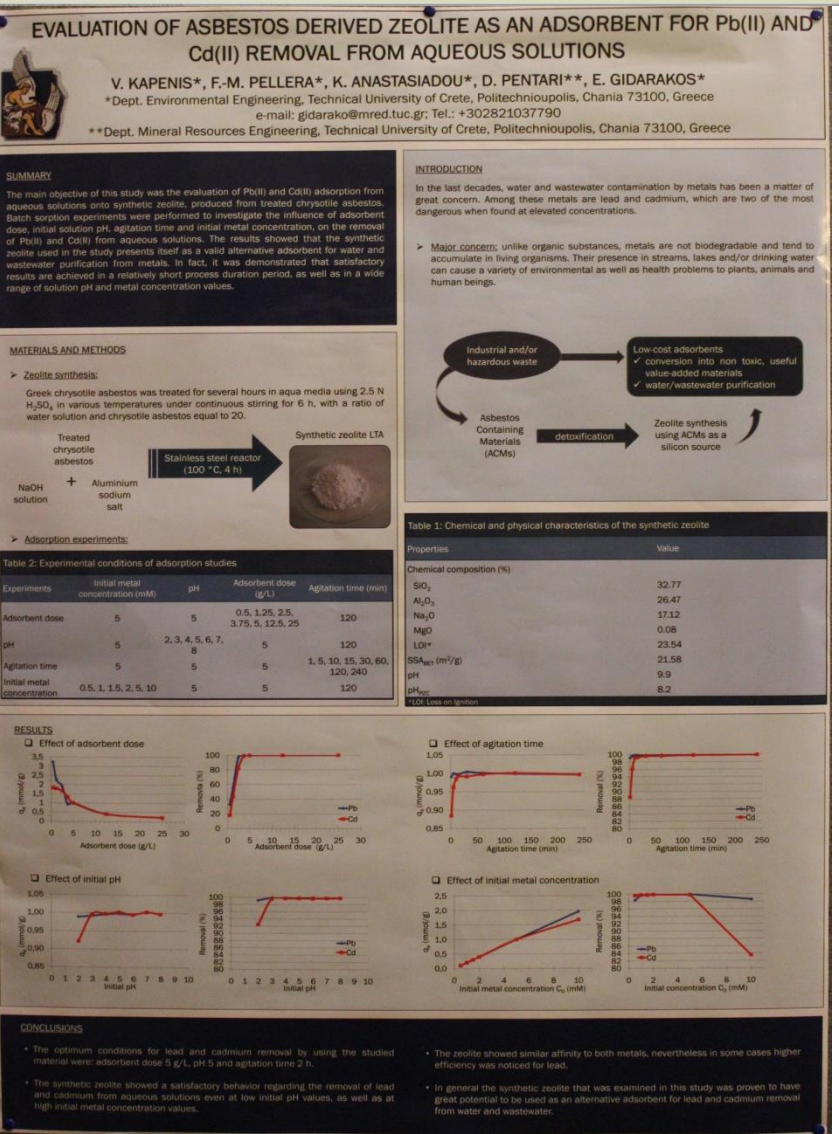

EVALUATION OF ASBESTOS DERIVED ZEOLITE AS AN ADSORBENT FOR Pb(II) AND Cd(II) REMOVAL FROM AQUEOUS SOLUTIONS

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SUMMARY

The main objective of this study was the evaluation of Pb(II) and Cd(II) adsorption from aqueous solutions onto synthetic zeolite, produced from treated chrysotile asbestos. Batch sorption experiments were performed to investigate the influence of adsorbent dose, initial solution pH, agitation time and initial metal concentration, on the removal of Pb(II) and Cd(II) from aqueous solutions. The results showed that the synthetic zeolite used in the study presents itself as a valid alternative adsorbent for water and wastewater purification from metals. In fact, it was demonstrated that satisfactory results are achieved in a relatively short process duration period, as well as in a wide range of solution pH and metal concentration values.

INTRODUCTION

In the last decades, water and wastewater contamination by metals has been a matter of great concern. Among these metals are lead and cadmium, which are two of the most dangerous when found at elevated concentrations.

- Major concern: unlike organic substances, metals are not biodegradable and tend to accumulate in living organisms. Their presence in streams, lakes and/or drinking water can cause a variety of environmental as well as health problems to plants, animals and human beings.

Industrial and/or hazardous waste → Low-cost adsorbents
- ✓ conversion into non toxic, useful value-added materials
- ✓ water/wastewater purification

Asbestos Containing Materials (ACMs) → detoxification → Zeolite synthesis using ACMs as a silicon source

MATERIALS AND METHODS

- Zeolite synthesis:

Greek chrysotile asbestos was treated for several hours in aqua media using 2.5 N H_2SO_4 in various temperatures under continuous stirring for 6 h, with a ratio of water solution and chrysotile asbestos equal to 20.

Treated chrysotile asbestos + NaOH solution + Aluminium sodium salt → Stainless steel reactor (100 °C, 4 h) → Synthetic zeolite LTA

- Adsorption experiments:

Table 2: Experimental conditions of adsorption studies

Experiments	Initial metal concentration (mM)	pH	Adsorbent dose (g/L)	Agitation time (min)
Adsorbent dose	5	5	0.5, 1.25, 2.5, 3.75, 5, 12.5, 25	120
pH	5	2, 3, 4, 5, 6, 7, 8	5	120
Agitation time	5	5	5	1, 5, 10, 15, 30, 60, 120, 240
Initial metal concentration	0.5, 1, 1.5, 2, 5, 10	5	5	120

Table 1: Chemical and physical characteristics of the synthetic zeolite

Properties	Value
Chemical composition (%)	
SiO_2	32.77
Al_2O_3	26.47
Na_2O	17.12
MgO	0.08
LOI*	23.54
SSA_{BET} (m^2/g)	21.58
pH	9.9
pH_{PZC}	8.2

*LOI: Loss on Ignition

RESULTS

- Effect of adsorbent dose
- Effect of agitation time
- Effect of initial pH
- Effect of initial metal concentration

CONCLUSIONS

- The optimum conditions for lead and cadmium removal by using the studied material were: adsorbent dose 5 g/L, pH 5 and agitation time 2 h.
- The synthetic zeolite showed a satisfactory behavior regarding the removal of lead and cadmium from aqueous solutions even at low initial pH values, as well as at high initial metal concentration values.
- The zeolite showed similar affinity to both metals, nevertheless in some cases higher efficiency was noticed for lead.
- In general the synthetic zeolite that was examined in this study was proven to have great potential to be used as an alternative adsorbent for lead and cadmium removal from water and wastewater.

2nd Award

Evaluation of Asbestos Derived Zeolite as an Adsorbent for Pb(II) and Cd(II) Removal From Aqueous Solutions

by

Kapenis V., Pellera F.-M., Anastasiadou K., Pentari D., Gidarakos E.

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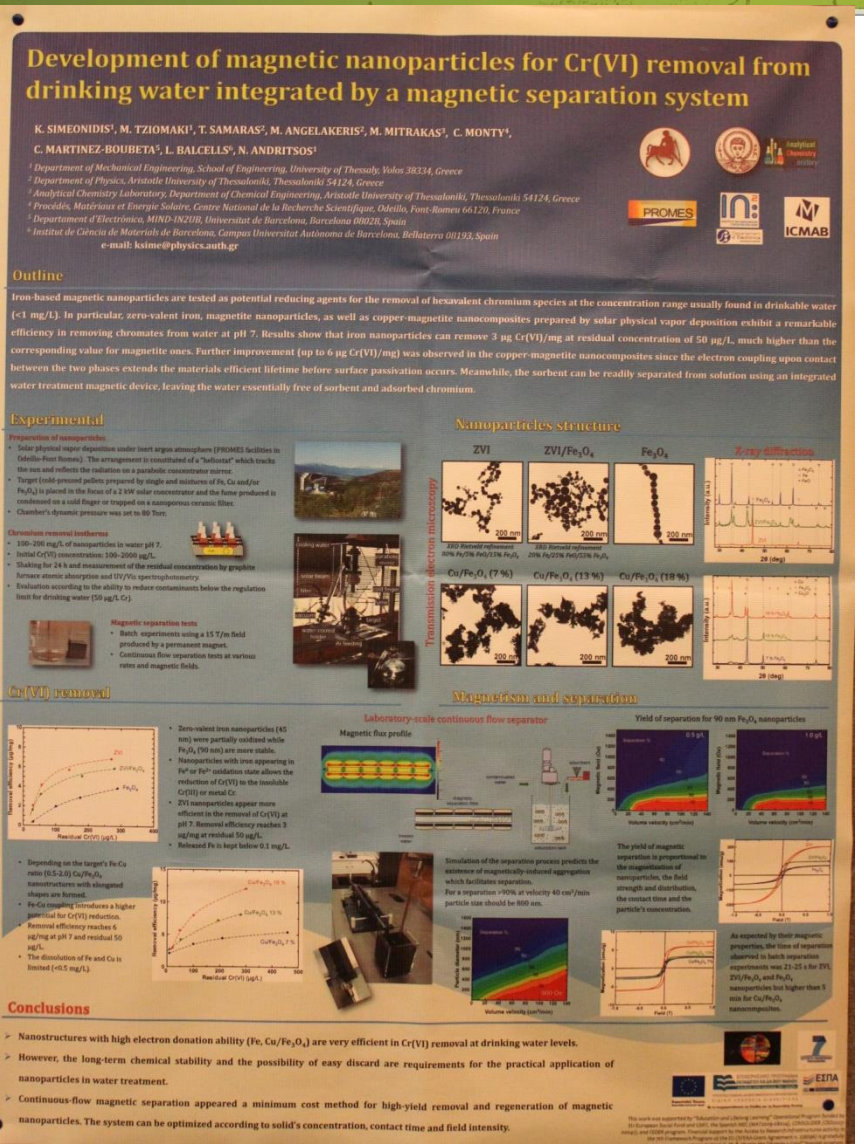

1st Award

Development of magnetic nanoparticles for Cr (VI) removal from drinking water integrated by a magnetic separation system

by

Simeonidis K., Tziomaki M., Samaras T., Angelakeris M., Mitrakas M., Monty C., Martinez-Bouveta C., Balcells L, Andritsos N.