STUDIA UBB AMBIENTUM, LXI, 1-2, 2016, pp. 97-103
(RECOMMENDED CITATION)

WASTE RECOVERY FROM LEATHER

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ABSTRACT. This study aims procurement and testing of ways using leather waste from tanneries, by incorporating them into a composite. This new material was subjected tests to determine leachability total chromium and lead in leather waste. Flow of production was as follows: grinding skin, placing the composite composition of a CRT glass waste to replace natural aggregates, own recipes, samples forming and demoulding. The new composite was then subjected to leachability test for total chromium and lead. The primary objective of this study was to achieve a composite material that can be used as material for the construction, in compliance with current standards of construction and environmental legislation.

The proposed method of waste recovery skin is viable and beneficial to the environment and provides economic benefits by creating jobs.

Key words: *recovery, waste leather, composite material, leachability.*

INTRODUCTION

It can be noted that in the European Union, in 2006 skin processing sector reached about 3700 enterprises. These tanneries are small and medium, developement by families. European tanners are dependent on raw material from outside the European continent. In recent years, this sector is in a downward because Asian and American market experienced a significant development. (Source: www.ec.europa.eu/eurostat).The European Directive 75/442 defines as solid waste: ''any substance or object in the categories from Annex 1, from which the holder discards or intends or is forced to discard''.

Annex 1 clarifies important aspects of which offer the following:

- ✓ it is not mentioned in the specificated notebook;
- ✓ accidentally spilled materials, lost or having undergone other mishap, or any materials equipment;
- ✓ materials that are contaminated or soiled as a result of planned actions;
- ✓ wastes from industrial processes (clay);
- ✓ residues from pollution abatement processes (air filters)

After this pleading about solid waste, can be mentioned unequivocally that the skin is part of this category. This skin-waste results from a technological flow shown in Fig. 1.

Fig. 1. *Waste from processing of hides and skins tanneries* (Coară et al., 2003).

It can be observed an alarming rate of solid waste higher than 70%. Many institutions of environment focus on water and ground factor. This industry it is important to tanneries because it needs chemical products and in particular because it is needed a large amount of water that is producing huge amounts of industrial waters, which can be categorized as representing ''chemical bombs'' for the environment (Ozgunay et al., 2007).

The needs of population growth have imposed extensive development of the industry through a variety of products through processing and high-tech materials and energy resources. Both directions of development involves an excessive exploitation of natural resources and artificiality material assets compared to the structure of primary resources, constituting essentially an impact aggressive on the balance of the environment, also both in the recovery and conservation of resources and the degree of assimilation / absorption of waste of any kind, whether production waste or consumption waste (Kolomaznik et al., 2008)

In the contemporary society, was imposed a more efficient development of the industry by using production processes in closed system or integrated use of material resources and energetical. This is a result of pressure from some regulation: administrativ, legal, public, circumstantial, local, regional or international, to the environment. The entire industrial process can be thought as a closed cycle, so the manufacturer assumes a total responsibility for the product design as a provider of a temporarily service (Yilmaz et al., 2007)

MATERIALS AND METHODS

New composite material structure

The easiest way that provides clear information is through the flow of implementation process of the composite material shown in Fig. 2.

The first stage of grinding was done with IKA A11 basic tool, located at the Technical University.

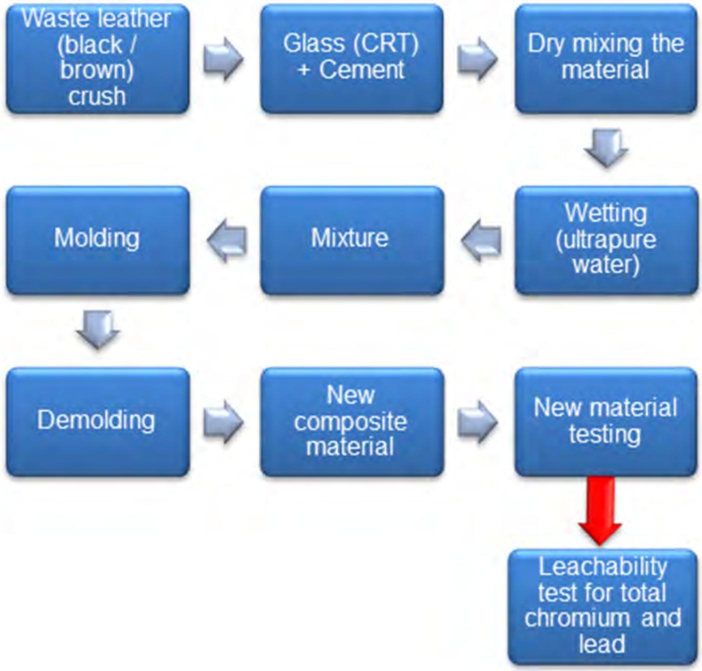

Fig. 2. *Flow stages of achieving and testing of composite material*

Fig. 3. *IKA A11 basic tool*

It has two different procedures for use (source:www.profilab24.com/IKA-A-11-basic-Analytical-mill):

- grinding of hard, breakable or non-elastic materials; the blender is stainless steel and it can be used for a Mohs hardness up to 6.
- cutting soft, fibrous materials; the grinding/cutting is made into a Teflon room, with stainless steel and 80 ml of volume.

The purpose of this paper is to obtain a composite material of solid waste-leather viable for the buildings. Thus, it was thought a recipe for composite material based on article published by Roșu et al. (2015) and Popita et al. (2016), like in Fig. 4.

Composite Material			
Waste leather (black / brown) crush	Glass (CRT) crush	Ultrapure water	White cement CEM_II_A_L_52.2N

Fig. 4. *New composite material recipe*

The homogenized material was poured into formwork 4x4 [cm], left for hardening for 3 days and then was peeled. The new composite material is showing in Fig.5.

Fig. 5. *The new composite with: black leather (left) and brown leather (right)*

Test stages

As evidenced in previous chapters, a major goal is to determine the concentration of total chromium and lead from the new composite material obtained. There were obtained four samples (both from brown and dark leather), and the procedure for both types of leather for testing total chromium and lead is, this stage was done at Faculty of Environmental Sciences and Engineering:

In the first step, the samples were subjected to ultrasound. For this test, there were used four Berzelius beakers and were created four different pH environments:

- ➢ in the first Berzelius beaker it was found a pH between 2-3;
- ➢ in the second Berzelius beaker it was found a pH between 5-6;

- in the third Berzelius beaker it was found a pH between 9-10;
- in the fourth Berzelius beaker it was found a pH=12.

For the acidic environment it was used a HNO_3 solution, for the basic environment a NaOH solution, for pH between 5-6 it was used demineralized water. In all recipients has been introduced an amount of 20 mL of solution, according to the MO 95/2005. Afterwards, the recipients were introduced, in number of four, for 30 minutes to ultrasound at ambient temperature.

In the second step, after completed the ultrasound procedure, the samples were removed from Berzelius beakers and passed to the filtration step. Then, the samples were adjusted for a pH of 2 with a HNO_3 solution and following after that to be analyzed with an AAS ZEEnit 700 Analytic Jena Spectrometer, flame method, in order to establish the concentration of total chromium and lead.

RESULTS AND DISCUSSIONS

After analyzing with a spectrometer AAS ZEEnit700 Analytic Jena, the concentration of total chromium (without atomic speciation) and lead, the results are in Tabel 1.

Tabel 1. *Total chromium and lead concentrations for different pH*

Composite with leather	pH	Crtotal [mg/kg]	Pb total [mg/kg]	Cr** total [mg/kg]	Pb** total [mg/kg]
Black	2-3	0.59	2.07	0.20	0.20
	5-6	0.28	1.85	0.20	0.20
	9-10	0.28	BDL	0.20	0.20
	12	0.45	0.04	0.20	0.20
Brown	2-3	0.44	BDL	0.20	0.20
	5-6	0.96	4.88	0.20	0.20
	9-10	0.67	7.51	0.20	0.20
	12	2.33	BDL	0.20	0.20

***MO 95/2005- concentration maximum admise (CMA)BDL – below detected limit*

Black leather composite material shows some interesting things. In acidic medium, the concentration of chromium and lead exceeding MAC, this was expected. Between pH 5-6 we have an interesting thing we have a very close CMA total chromium but is well above the total lead CMA. Between pH 9-10 we have a resemblance to pH 5-6 chromium close by CMA total value and total value of lead BDL. At pH 12 total chromium is 0.45 [mg/kg] compared to 0.20 [mg/kg] lead CMA and CMA total value is below (Fig.6.)

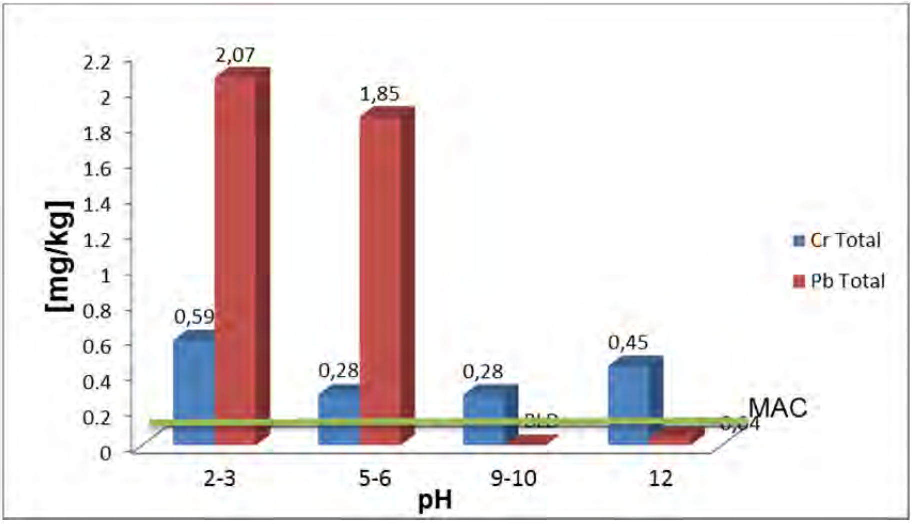

Fig. 6. *Composite with black leather*

Brown leather composite material entails a more rigorous attention. In acid environment, total chromium is 0.44 [mg/kg] double of the CMA and lead is BDL. Between pH 5-6 and 9-10 lead values is more than CMA, 24 and 37 times higher, total chromium is between 0.67-0.96 [mg/kg]. Last pH 12 shows a value of 12 times the total chromium CMA and total lead is BDL (Fig. 7).

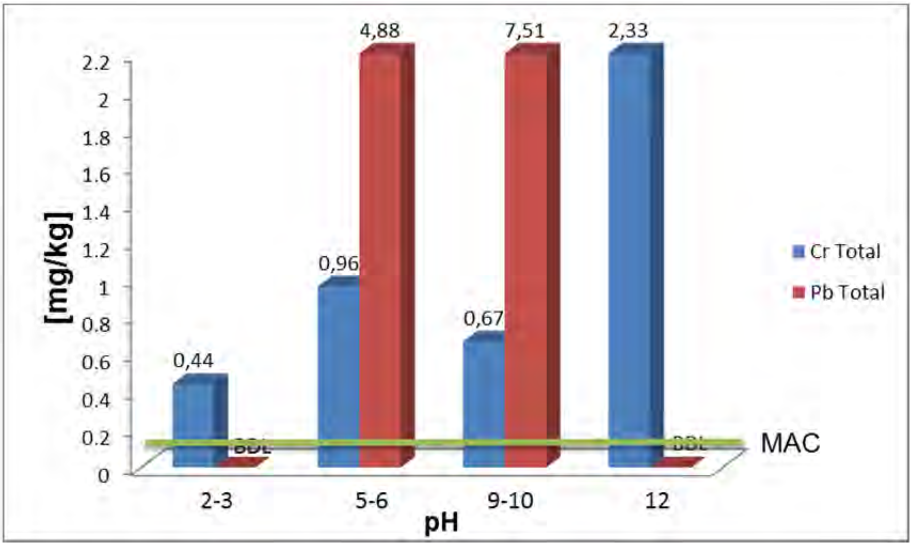

Fig. 7. *Composite with brown leather*

CONCLUSIONS

This study failed to show that leather waste storage is not a solution. This way to encapsulate a composite both leather and glass waste CRT has demonstrated that it can. Future directions should take into account the concentration of heavy metals in composite trying to reduce their percentage, mechanical testing for evidence of mechanical properties of the composite and market introduction of new composite materials in construction.

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