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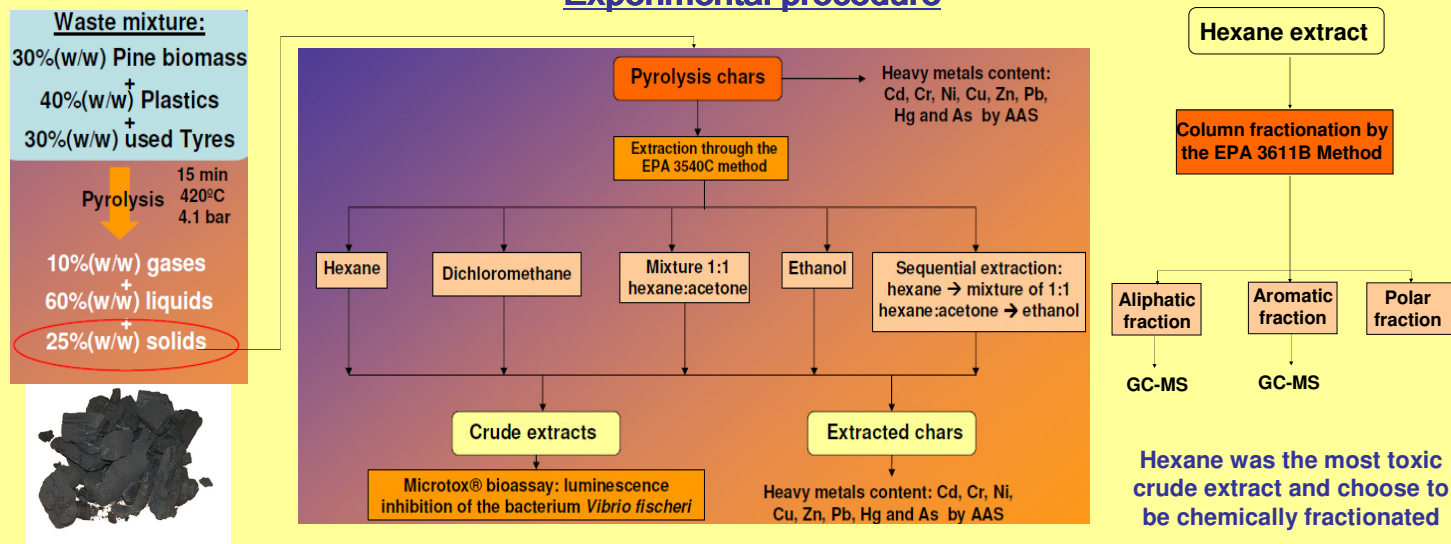
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## Abstract

The present work is devoted to the study of chars obtained in the co-pyrolysis of plastics, biomass and tyres wastes. The composition of these chars is not yet well studied and only recent an attempt was made by the authors to provide some information about the composition and risk assessment of these materials.

The objectives of this work were: to perform solvent extractions, using different solvents, in chars obtained in the co-pyrolysis process; to evaluate the extraction efficiency by characterising the different solvent extracts obtained as well as the extracted chars; to perform a chemical and bioassay fractionation in the most toxic crude extract in order to study the chemical composition of the fractions as well as their individual contribution to the global toxicity of the crude extract. The results will allow to conclude which solvent should be used in the decontamination of the pyrolysis chars.

## Experimental procedure



## Results

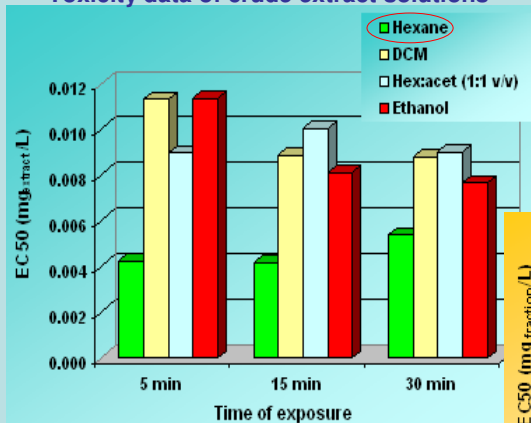
### Sequential extraction-extract yields

Extraction step	Extraction solvent	Extract yield (% g/g sample)
1	Hexane	58.1
2	Hexane:Acetone (1:1 v/v)	17.2
3	Ethanol	1.9

### Sequential extraction-toxicity data

Extraction step	EC <sub>50</sub> (mg extract/L)		
	5 min	15 min	30 min
1 (Hexane)	0.004	0.004	0.005
2 (Hexane:acetone 1:1 v/v)	0.031	0.044	0.045
3 (Ethanol)	0.147	0.131	0.150

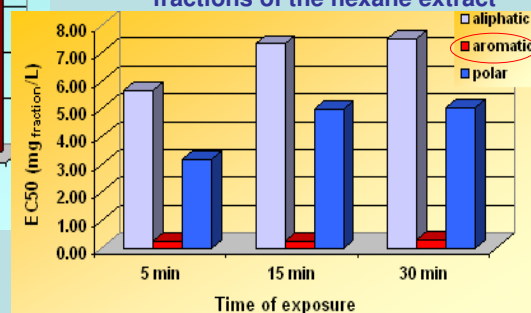
### Toxicity data of crude extract solutions



### Single extraction-extract yields

Extraction solvent	Extract yield (% g/g sample)
Hexane	58.1
Dichloromethane	54.9
Hexane:acetone (1:1 v/v)	40.6
Ethanol	32.6

### Toxicity data for the chemical fractions of the hexane extract



### Metal content – raw and extracted chars

Metals (mg/kg)	Raw char	Char Hex	Char DCM	Char Hex:Acet	Char Et	Char Seq
Pb	23.6±6.6	73.3±2.8	61.5±0.3	61.6±2.0	55.1±5.9	76.6±5.9
Zn	3 615±539	12 142±221	9 868±352	8 388±1267	6 686±612	9 128±183
Cu	1.9±1.5	3.8±0.6	4.0±2.6	<1.0	3.4±0.5	4.5±2.5
Hg	0.17±0.09	0.09±0.02	0.22±0.01	0.27±0.10	0.24±0.02	0.25±0.05
As	0.09±0.04	0.21±0.07	0.12±0.03	0.30±0.08	0.24±0.05	0.29±0.01

## Conclusions:

- More efficient extraction solvent to be used in the organic decontamination of chars is hexane.
- A combination of extraction solvents, could be used to remove more efficiently different classes of organic contaminants.
- A "petroleum like" profile exhibited by the aromatic fraction obtained in the fractionation procedure of the hexane extract can explain the high toxicity exhibited.
- The char obtained after the organic decontamination still have significant amounts of Pb and Zn that can be leached, but it was previously demonstrated by the authors that the mobility of these heavy metals is suppressed in the extracted pyrolysis chars.

### GC-MS chromatogram of the aromatic fraction

