

Analysis of Organic Matter and Heavy Metal Extraction Kinetics of Different Pyrolized Waste Fractions

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Samples

Source of samples > Zöld Híd Régió Nonprofit Kft. (Regional Waste Treatment Plant, Gödöllő)

- 1 PET
- 2 PAPER
- 3 WASTE TO DEPOSE
- 4 RDF (Refuse Derived Fuel)
- 5 MIXED URBAN SOLID WASTE



- 6 ORGANIC MANURE *from SZIU Dept of Animal Husbandry*

Pyrolizis of samples

2.5 g samples into test tube

10 cm³ distilled water

Al folia plug against the air diffusion

Heating temperature 350-500 °C

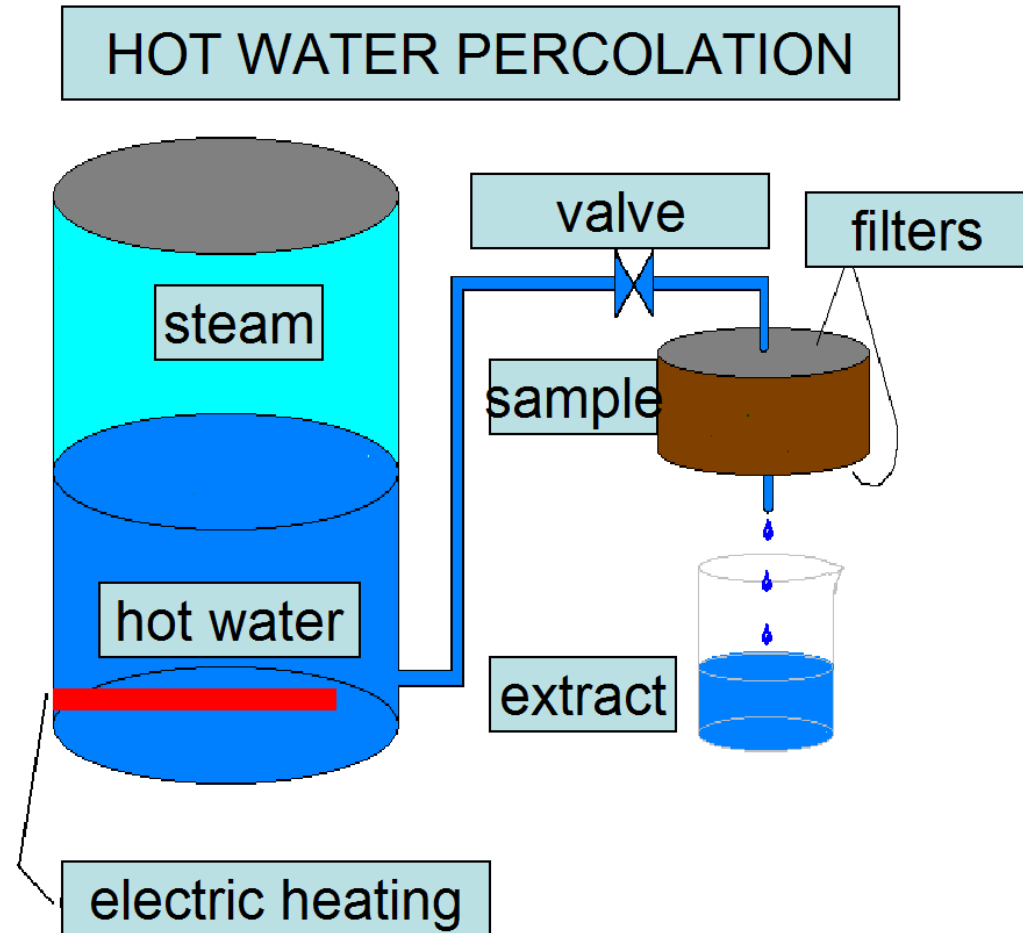


Hot Water Percolation

2.5 g waste or char samples into test tube

20 g quartz sand

5 x 100 cm³ fraction by hot distilled water



Analytical, data management methods

Analytical:

Organic matter – spectrophotometer 360-500 nm

Heavy metals – ICP AES

Data management:

Non linear regression analysis

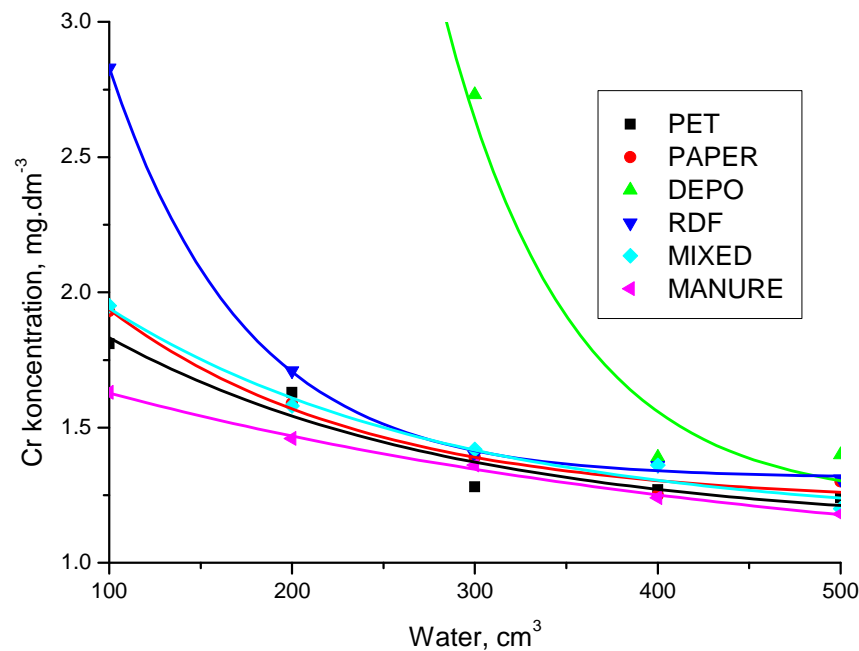
ORIGIN 7.5 software

Results and discussion, Cr

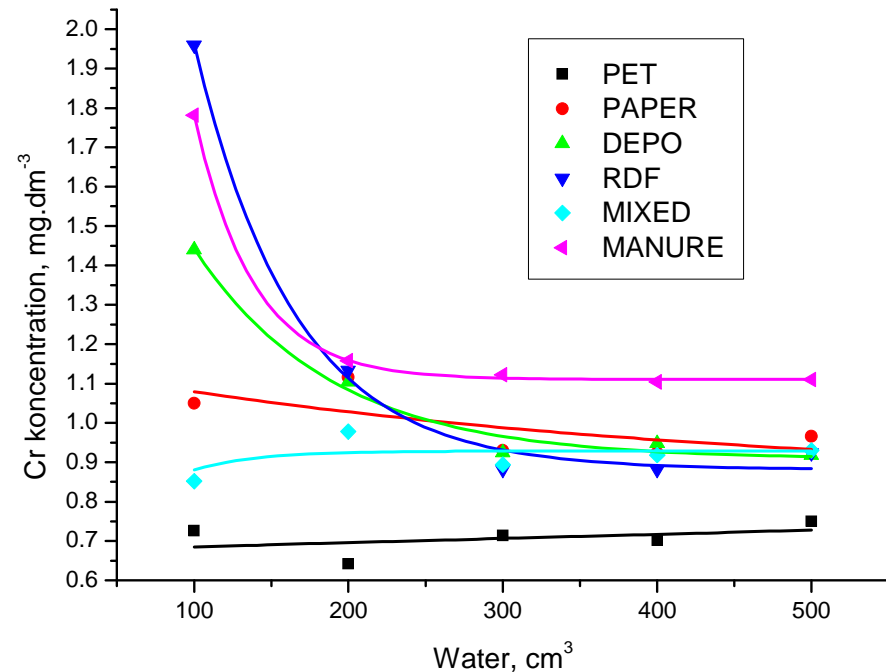
Depo fraction – decreased

PET and MIXED – getting constant by pyrolizis

Others not changed by the thermal treatment



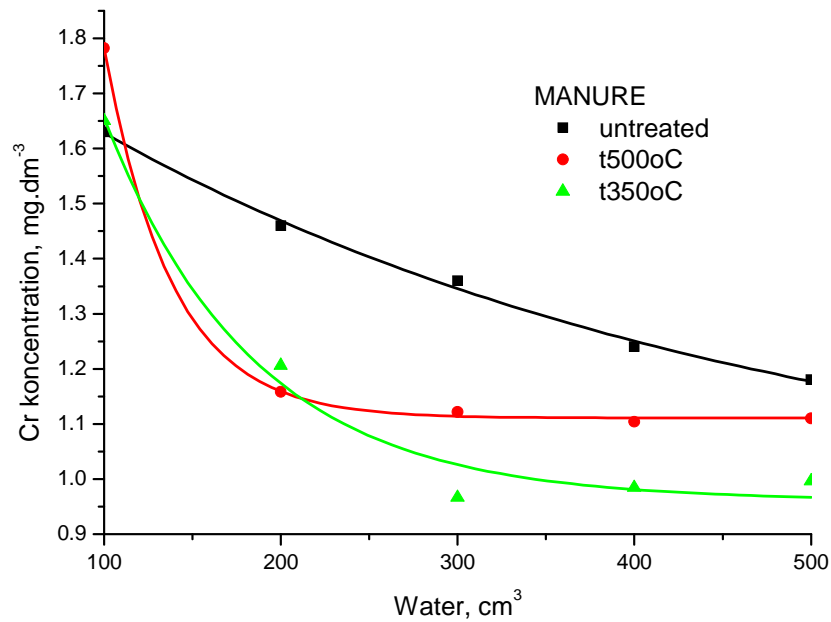
Original waste



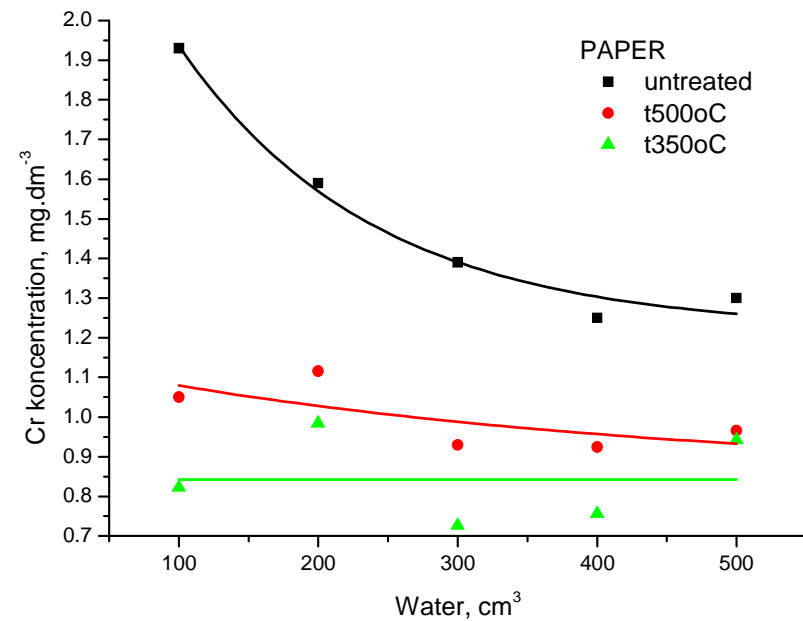
Pyrolized 500 °C

Effect Of Temperature, Cr

The thermal treatment decreases the extracted Cr amount



MANURE

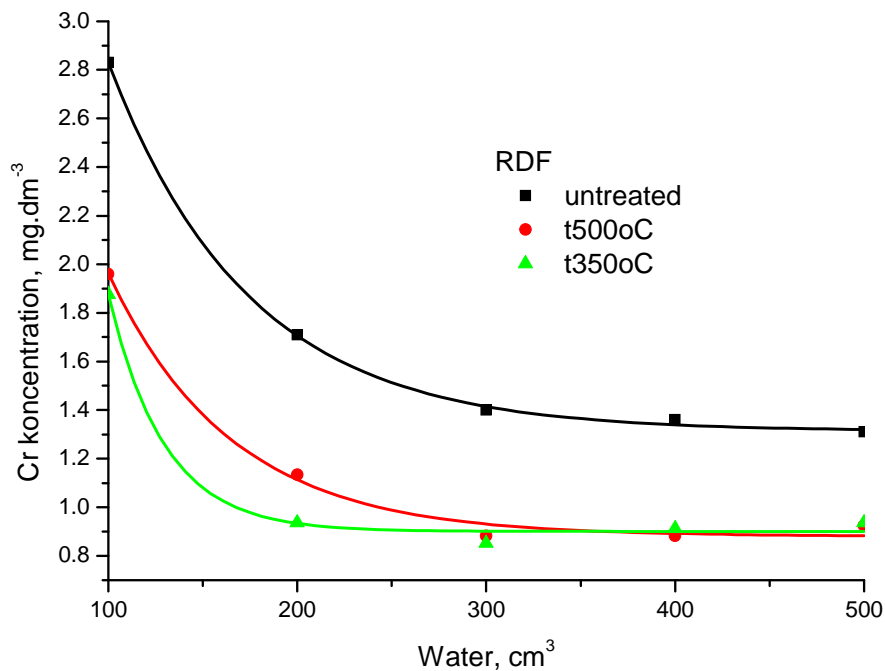


PAPER

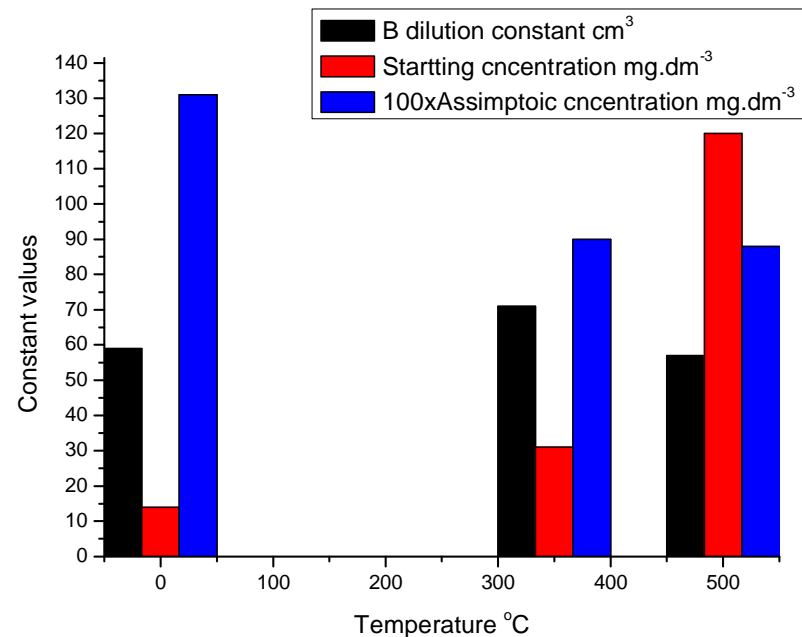
Kinetical analysis, Cr

The starting concentration increasing with temperature
The asymptotic concentration decreasing with temperature
The dilution constant is maximal at 350 °C

$$y = A_1 \cdot e^{-\frac{x}{t_1}} + y_0$$



Extraction curves

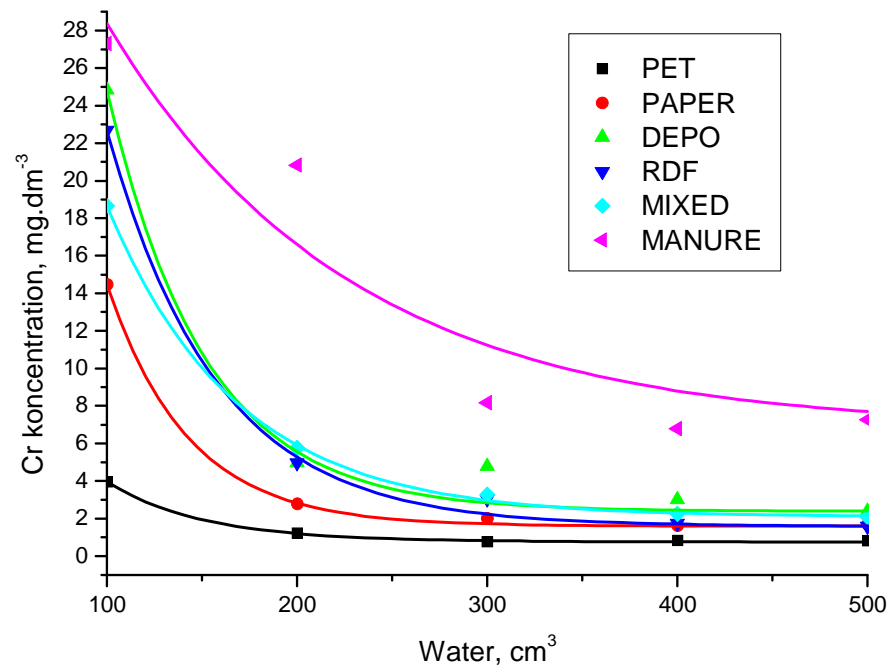


Fitting constants

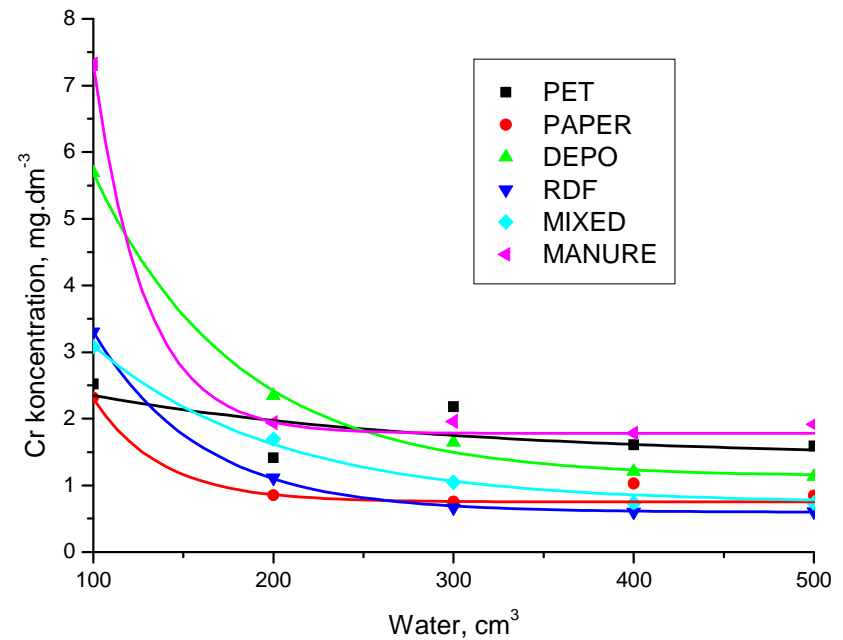
Results and discussion, Cu

All fraction – decreased

PET– getting constant by thermal treatment



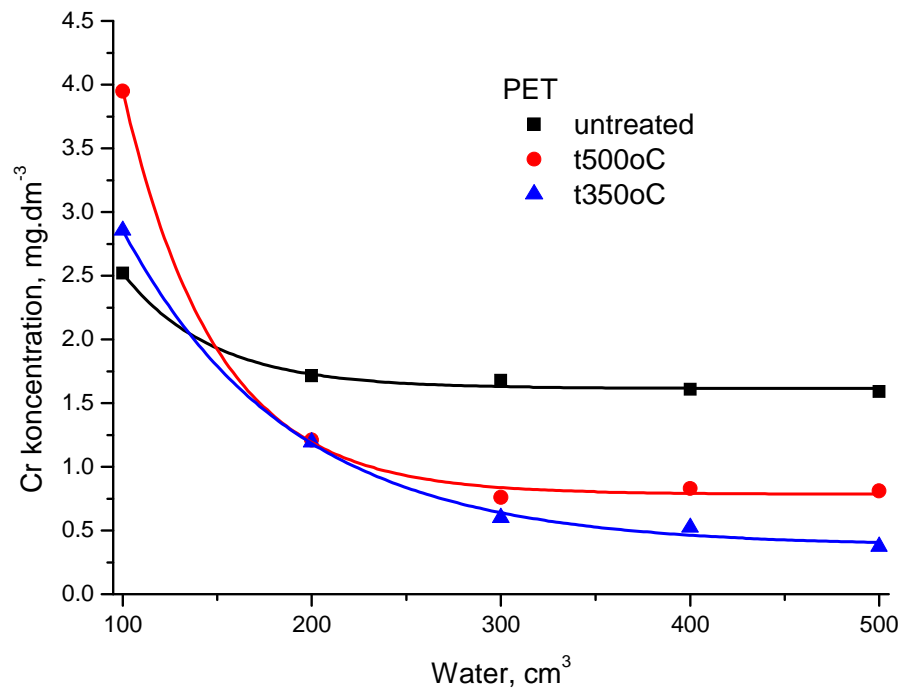
Original waste



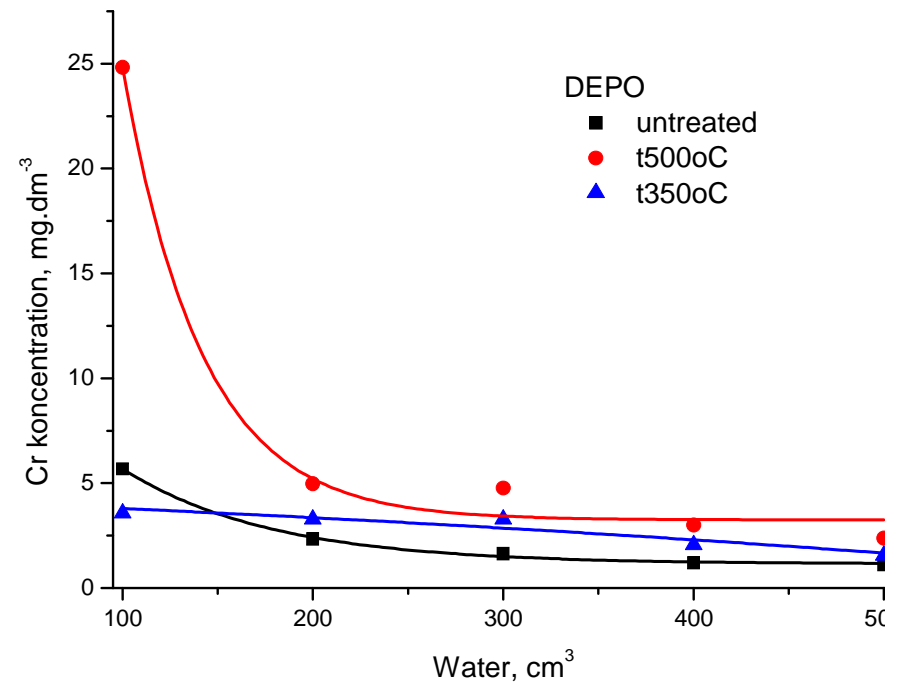
Pyrolyzed 500 °C

Effect Of Temperature, Cu

The Cu starting concentration is maximal at 500 °C treatment, but the dilution rate is maximal in that case



PET



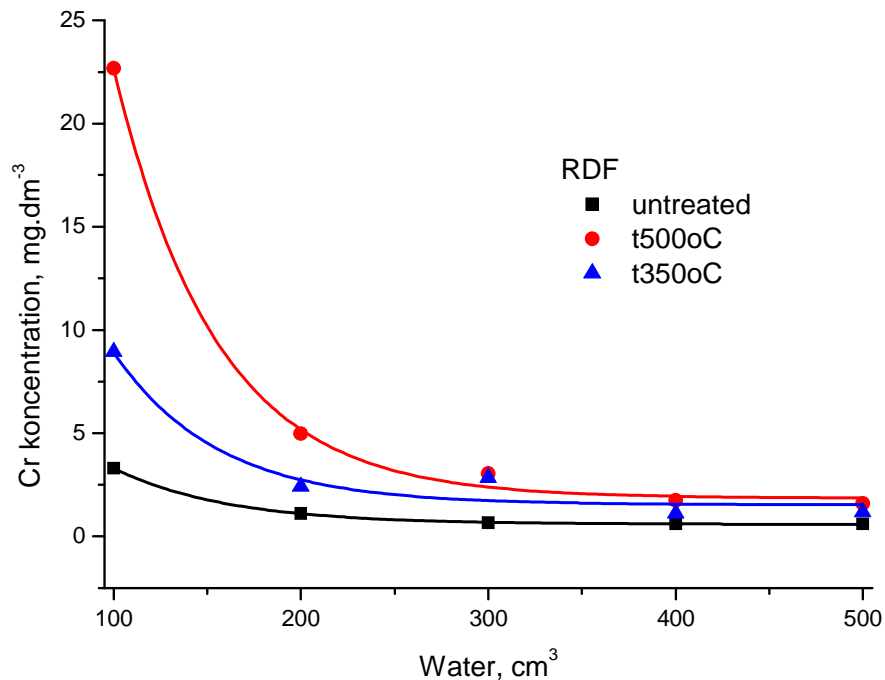
DEPO

Kinetical analysis, Cu

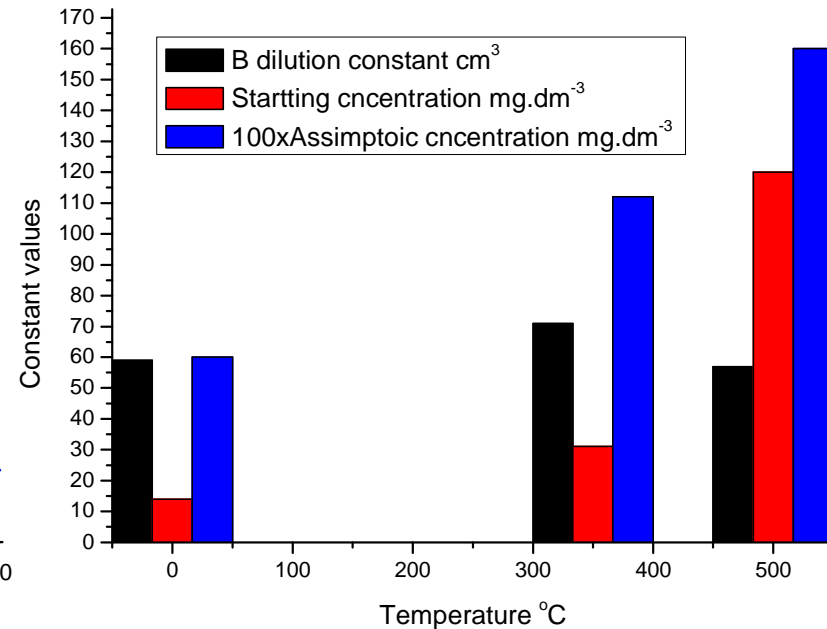
The starting and asymptotic concentration increasing with temperature

The dilution constant is maximal at 350 °C

$$y = A_1 \cdot e^{-\frac{x}{t_1}} + y_0$$



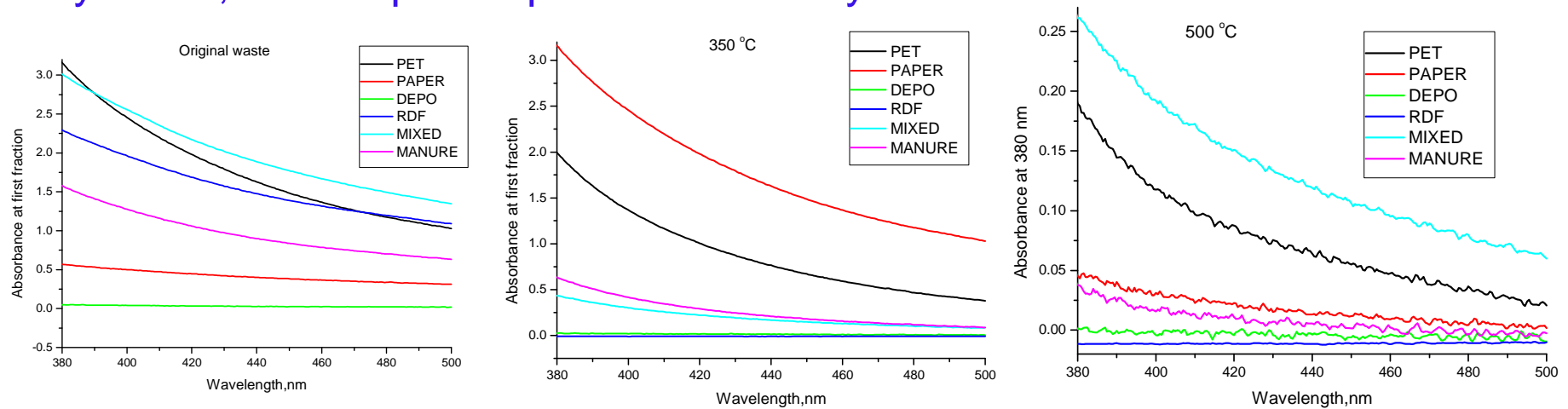
Extraction curves



Fitting constants

Results and discussion, OM

For hydrocarbons, at the 350-500 nm range, mainly the molecules with conjugated double bond (molecules with delocalized Pi electron systems) are showing absorption. Supposing the uniform distribution of Pi electron systems, the shape of spectra was analyzed.

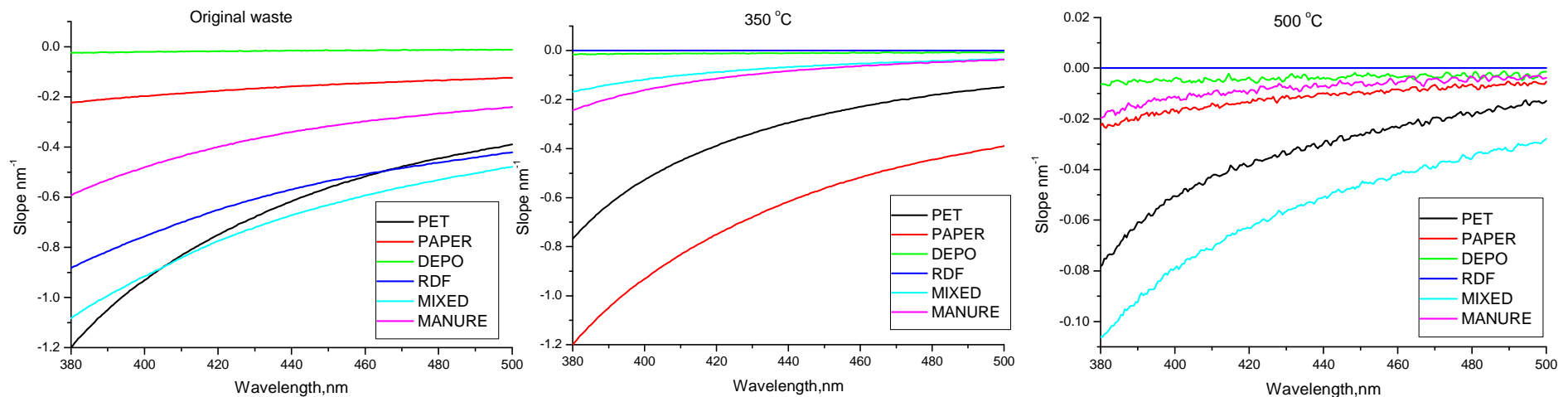


The mixed waste is minimal at 350 °C, but the paper is maximal in that temperature, (comparing all wastes)

The position of PET is almost constant.

Results and discussion, OM

Analyzing the changes of extracted organic matter we calculated the slope of decreasing absorbance in logarithmic scale, in the function of wavelength.



DEPO was constant, in all treatment, it means there is no changing molar weight during the extraction.

The biggest changing molar weight during the extraction was PET at no thermal treatment, the PAPER at 350 °C, and the MIXED WASTE at 500 °C

SUMMARY of Heavy Metals

Analyzing the changes of concentration of measured heavy metals during the extraction, we have got the following results:

The Cr concentration is usually decreased or not changed significantly with temperature

Modeling the extraction The starting concentration usually increasing with temperature.

The asymptotic concentration of Cr decreasing with temperature, but the asymptotic concentration of Cu increasing with temperature

SUMMARY of OM

Analyzing the changes of extracted organic matter absorbance and the slope of decreasing absorbance in logarithmic scale, in the function of wavelength. There are the following results:

The mixed waste is minimal at 350 °C, but the paper is maximal in that temperature, (comparing all wastes)

The position of PET is almost constant.

DEPO was constant, in all treatment, it means there is no changing molar weight during the extraction.

The biggest changing molar weight during the extraction was PET at no thermal treatment, the PAPER at 350 °C, and the MIXED WASTE at 500 °C

Thank you for attention

Acknowledgement

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