

# Pyrolysis of plastic waste from the dismantling of used vehicles

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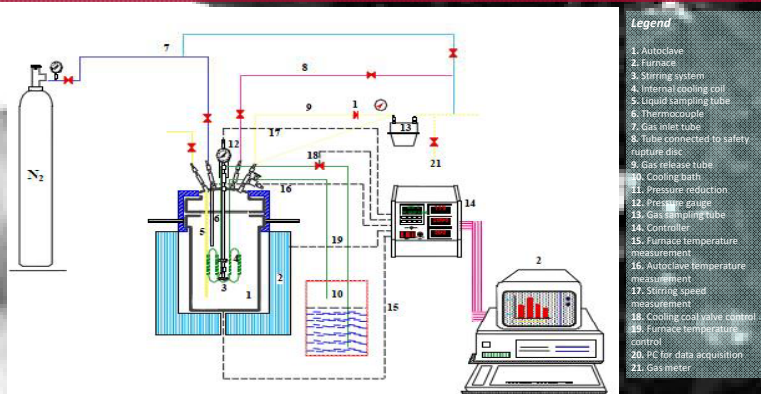
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## Abstract

The main objective of this study is to identify the experimental conditions that favor the production of bio-oil from pyrolysis of polypropylene (PP), coming from the scrapping of end-of-life vehicles. The experimental conditions tested were: initial pressure (2.1 to 10.3 bar), temperature (350 to 430° C) and reaction time (1 to 900 s). The study reveals that the conditions that increase the rate of conversion of PP into liquid fraction (> 80%) correspond to an initial pressure of 50 psi (3,45 bar), a temperature of 400° C and a reaction time of 15 minutes. All products obtained, gases, liquids and solids, were characterized and analyzed by gas chromatography (GC) and mass spectrometry (GC-MS).

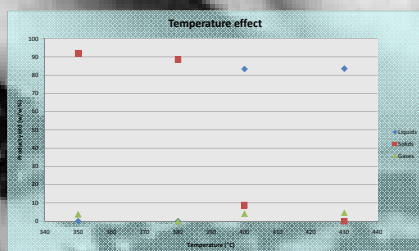
## Apparatus scheme



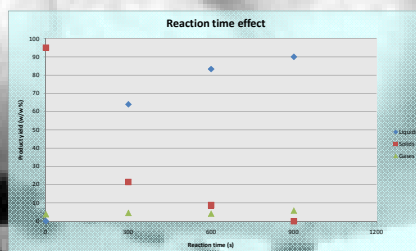
## Operational parameters of pyrolysis tests

Test	Temperature (° C)	N <sub>2</sub> pressure (bar)	Reaction time (s)
1	400	3,45	600
2	400	3,45	300
3	400	3,45	900
4	400	3,45	1
5	350	3,45	600
6	430	3,45	600
7	380	3,45	600
8	400	2,07	600
9	400	10,34	600

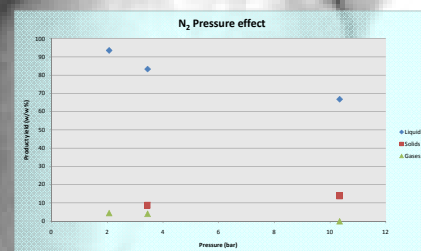
## Pyrolysis products yield (% m/m) - Influence of operational parameters



High temperatures favored the production of liquid and decreased the production of solids. The temperatures studied don't affect the amount of gases produced.



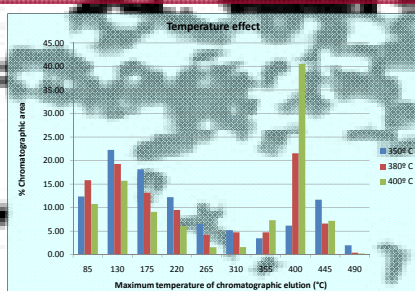
The increase in reaction time favored the production of liquid and reduced the production of solids. The amount of gas produced was not significantly affected.



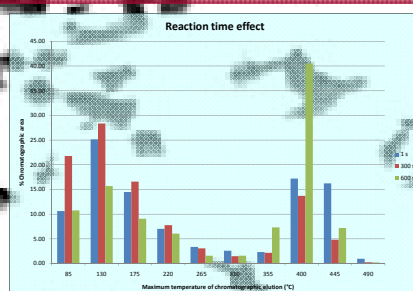
The results obtained showed that high pressures reduce the production of liquid, having the opposite effect on the production of solids. The percentage of gases was always very low.

## Characterisation of the liquid phase – Boiling point profile determined by GC-FID

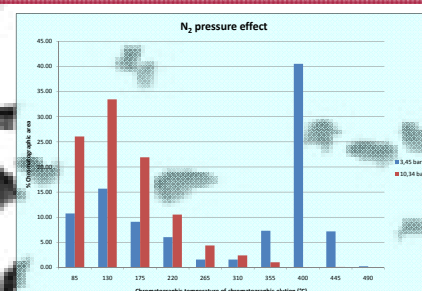
### Influence of operational parameters



Using a residence time of 600 s, the increase in temperature from 350° C to 400° C resulted in an increase in the relative amount of heavier compounds in the liquid phase.



At 400° C, the residence time that produced a lighter liquid phase was 300 s. Longer residence times increased the relative amount of heavier compounds.



At 400° C, the pressure that produced a lighter phase was 10,34 bar. A pressure lower favors the amount of heavier compounds.

## GC-MS profile of the liquid phase fractions obtained after pyrolysis PP at 400° C during 900 s

