

Chemical recycling of phenol formaldehyde

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Introduction

Phenol formaldehyde (PF) is non-biodegradable, leading to serious threats to fossil resources and global environmental crisis. Solvolysis, which uses reactive solvents to break chemical bonds in thermosetting resins, is considered one of the most promising recycling methods. (1)

The aim of the research is to recycle phenol formaldehyde through solvolysis using various solvents, a catalyst, temperatures and reaction times under atmospheric pressure. The characterization of the resulting products is done by GC/MS, HPLC, LC/MS FTIR and TGA. The expected fragments are phenols. (2)

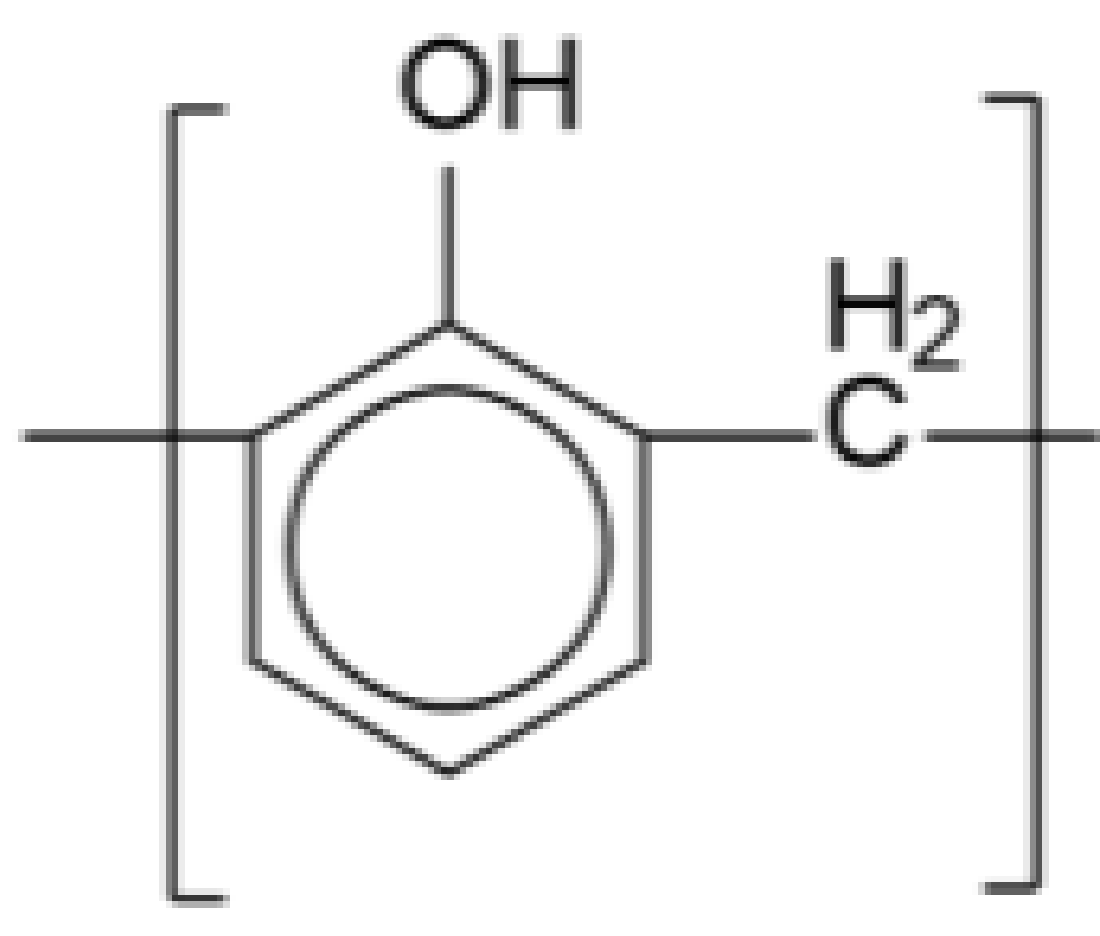


Figure 1: Structure of phenol formaldehyde (3)

Method

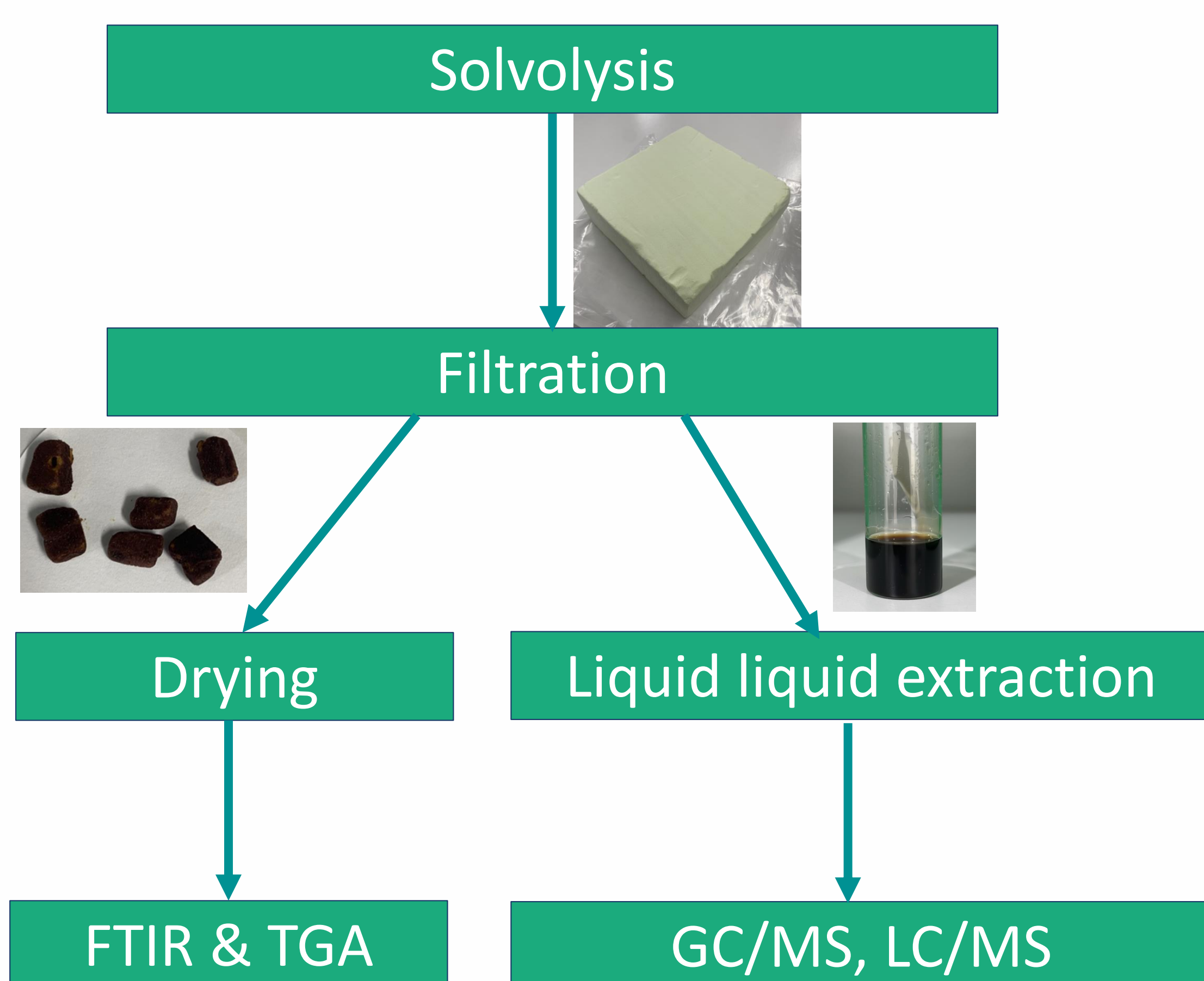


Figure 2: Flowchart of used methods

Results

The results of the LC/MS showed that the m/z of 95,0492 is the same as the m/z value of phenol. The m/z of 185,0809 is the same as the m/z value of 2,4,6-trihydroxymethylphenol.

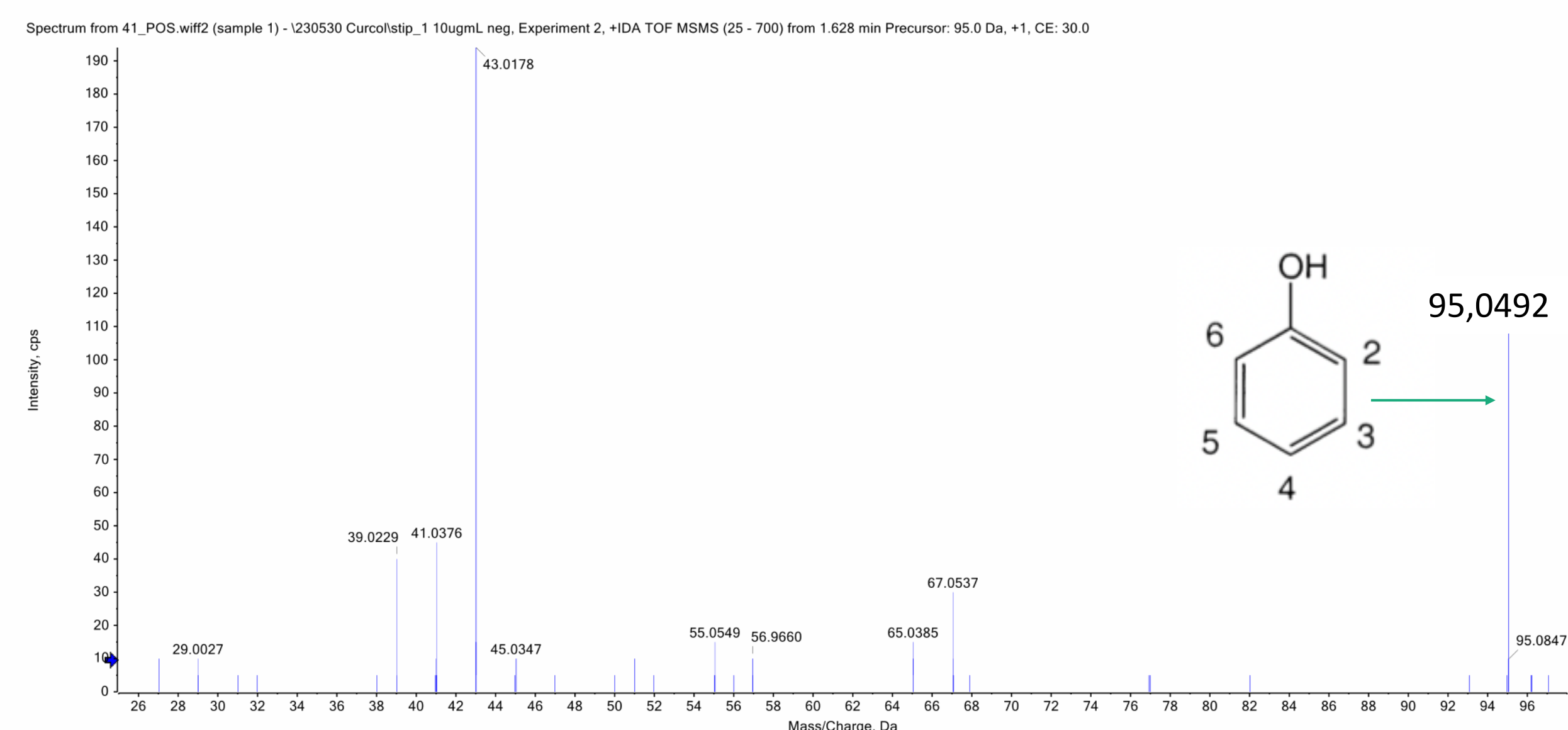


Figure 3: Mass spectrum focusing on m/z 95,04914

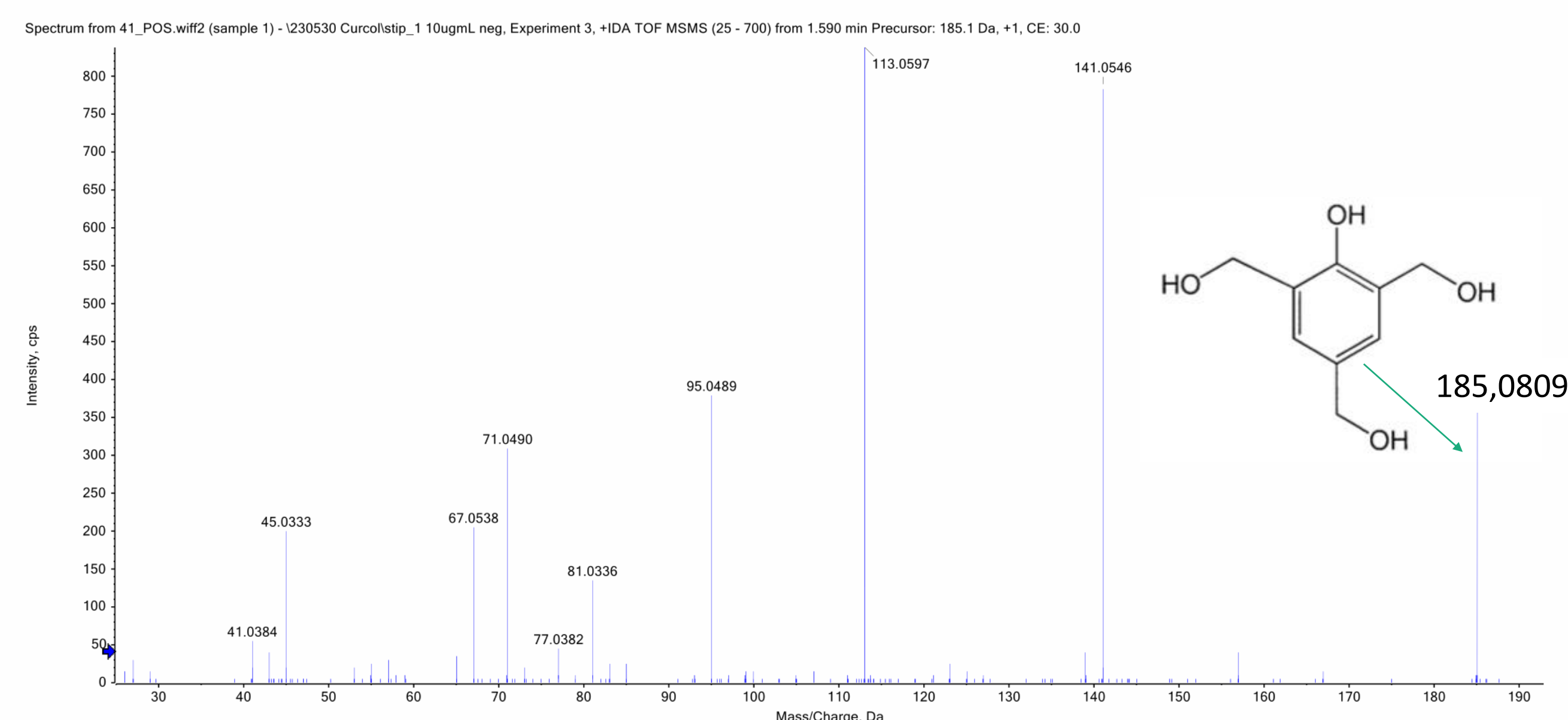


Figure 4: Mass spectrum focusing on m/z 185,08084

The effect of solvolysis conditions on the degradation degree of PF is shown in figure 5.

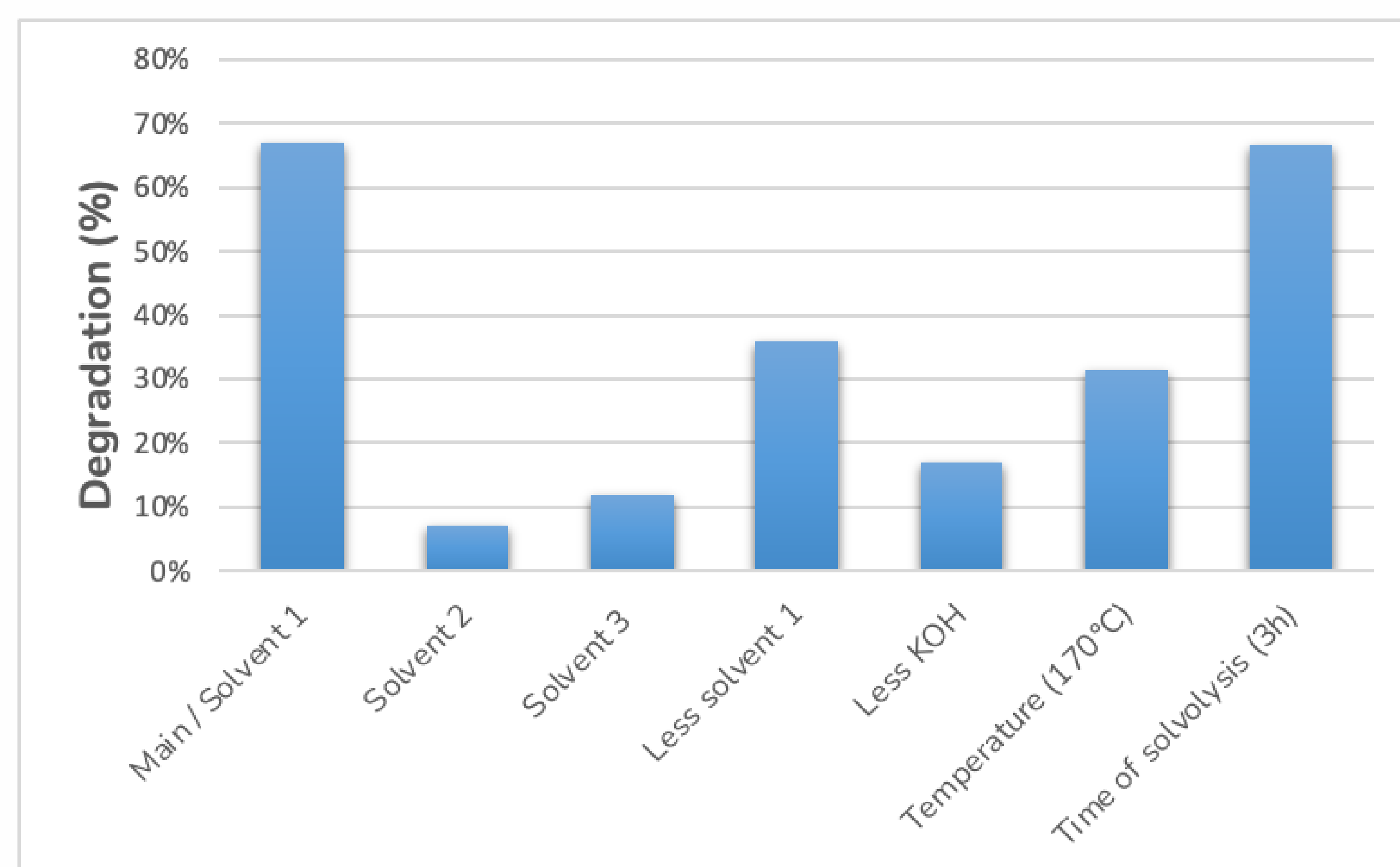


Figure 5: Degradation percentage of the different variables during solvolysis

The main solvolysis is DEG-KOH-PF-250°C-1,5h with 20 ml solvent and 1,0 g KOH

Conclusion

Phenol and 2,4,6-trihydroxymethylphenol are products that are formed after the solvolysis of phenol formaldehyde based on LC/MS.

The maximal degradation degree of 66% was achieved with solvent 1:KOH:PF = 20 ml : 1g : 1g at a temperature of 250°C for 1,5 hours

References

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