

# Purification of PHA

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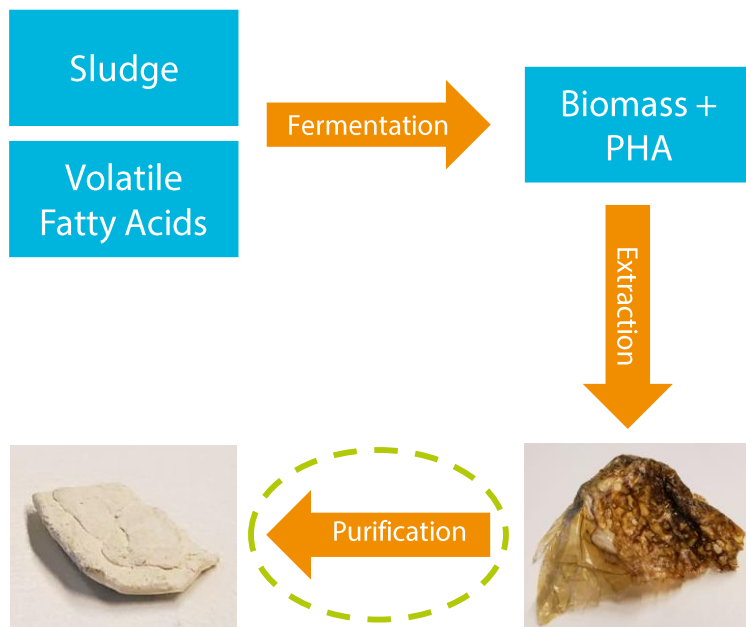
## INTRODUCTION

Polyhydroxyalkanoates (PHA) are polymers that can be accumulated by some bacteria as stockpile under stress conditions.

Secondary sludge from wastewater treatment plants is rich in PHA accumulating organism. This mixed microbial culture (MMC) accumulates the polymer when fed with volatile fatty acids (VFAs) through a feast and famine feed regime. The PHA can then be extracted from the biomass using organic solvents in a one or two steps extraction.

The present work aims to optimize the second step of a PHA extraction in order to make it a colorless compound that could be used in a wider range of applications.

## METHODOLOGY



The purification was done via reflux with 1-butanol at different times (0.5h; 1h and 2h) and ratios of non-purified PHA to solvent (1%; 2% and 4%).

## RESULTS

The 1-butanol treatment was more efficient in lower time and PHA to solvent ratio. That is because more non-PHA compounds were removed in these conditions which resulted in a whiter polymer.

The GC-MS showed a monomer ratio of around 35% of 3-HB and 65% of 3-HV. The monomer 3-hydroxy-2-methyl valerate (3H2MV) was also found in the polymer composition.

Throughout the GC-MS analysis, it was also possible to identify hexadecanoic acid, octadecanoic acid, abieta-8-en-18-oic acid, and dehydroabiatic acid in all the analyzed samples.

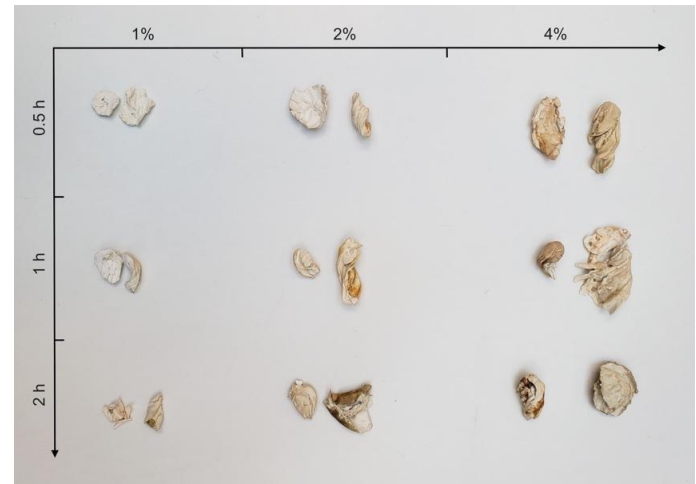


Figure 1 - Comparison between the purified PHA at different experimental points.

Although the different purification conditions resulted in noticeable different PHA final color, the TGA measurements for the polymer purity after the 1-butanol treatment were statistically the same in all cases but the assay at 1h with 4% ratio.

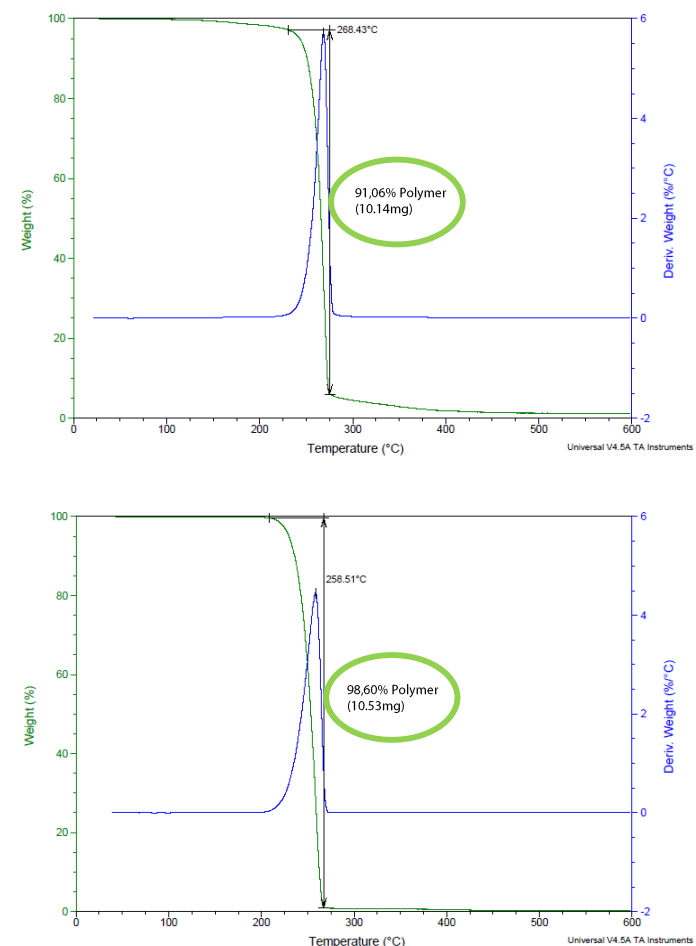


Figure 2 - TGA analysis for non-purified (above) and purified PHA (below).

## CONCLUSION

The polyhydroxyalkanoate purification can be successfully done via 1-butanol reflux as the second step of the extraction process. Lower time and non-purified PHA to solvent ratio are advised as they result in whiter polymers.