INTRODUCTION
Over the past years, sustainable production of bio-fuels and bio-plastics has increased continuously due to a higher demand but also to have less dependency on fossil sources [1]. One of these polymers is poly-lactic acid (PLA), synthesized by Carothers in 1932 out of lactic acid. Due to the excellent biocompatibility, mechanical properties and its nontoxicity to human body, PLA is widely used in tissue engineering, as function restoration of impaired tissues, as drug carrier or as a replacement of standard plastic in daily products. Lactic acid is mainly used in food industry as preservative and pickling agent [2].

CONCEPT
Currently a large portion of lactic acid is produced by fermentation of carbohydrates. The existing production processes use homolactic organisms such as Lactobacillus delbrueckii. To keep the fermentation running the pH needs to be kept at 5-6, for this Ca(OH)₂ is added to neutralize the produced lactic acid. Afterwards the built lactate gets acidified with H₂SO₄ to gain the L-lactic acid, a developed, to extract the lactic acid continuously without adding base or acid. A side effect is the production of gypsum as waste. Per ton produced lactic acid a ton of gypsum is produced. To prevent this side effect an extraction process was performed with the used extractants without any emulsifications in any of the membrane extraction systems. As a practical and possible industrial application (figure 6) grass was harvested, fermented, pressed, the gained grasspressjuice extracted and backextracted with both used extractants for comparison.

RESULTS
The membrane extractions were measured by refraction index as an in-process control (figure 4 and 5). On table 1 the most important results can be seen. As a practical and possible industrial application (figure 6) grass was harvested, fermented, pressed, the gained grasspressjuice extracted and backextracted with both used extractants for comparison. The membrane extraction with Trioclylamine reached with a concentration in the back extraction of 6.3 wt% the higher yield than with N,N-Didodecylpyridin-4-amine 5.0 wt%.

CONCLUSION
The membrane extraction and back extraction of lactic acid were successfully performed with the used extractants without any emulsifications in any of the phases. Also the final concentration of lactic acid of 6.3 wt% after the back extraction of grasspressjuice corresponds to approximately 63 % of the concentration reached in industrial scale with the addition of base and acid. All in all the membrane extraction as a method for the separation and recovery of lactic acid is very promising but needs further experiments, also with other sources as a fermentation broth where especially continuous experiments should can be performed.

REFERENCES