Comparative study of the influence of the macroactivator on the physicochemical properties of biodegradable copolyester-amides

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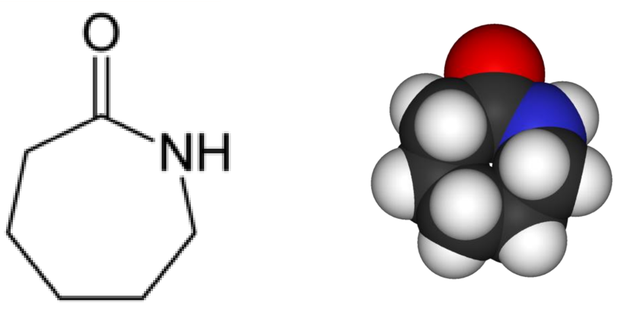
Introduction

We present the synthesis by anionic polymerization and our study on the physicochemical properties of biodegradable polyester amides (PEAs) consisting of poly (ε-caprolactam) (PCLA) and aliphatic polyester oligomers used as macroactivators (MA). The studied copolymers successfully combine the high mechanical properties of polyamides and the tendency to biodegradability of polyesters.

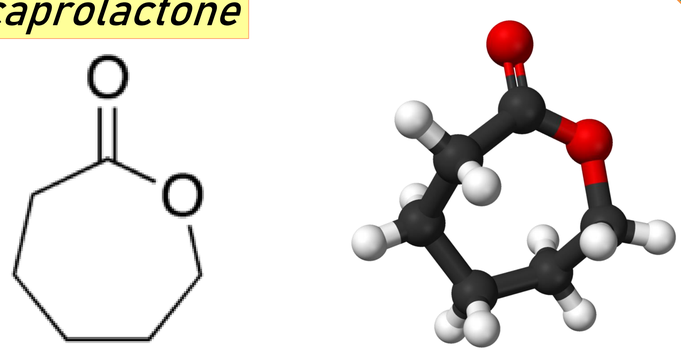
The content and molecular weight of MA in the obtained copolymers varies (550, 1250 and 2000 g.mol^{-1}) in order to clarify the influence of the macroactivator on some physicochemical parameters such as density, compactness and molar volume. The results obtained for copolyesters with the same composition but with different percentages of copolymers were compared and the results were analyzed in order to clarify the dependence of the properties on the composition.

ε-caprolactam

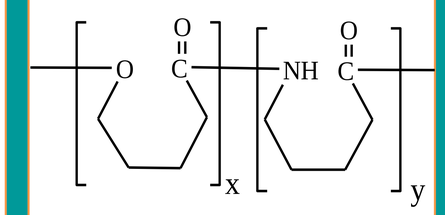


pycnometer

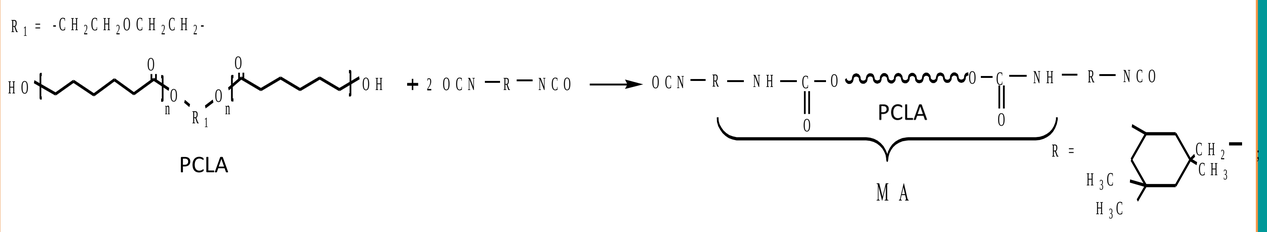
ε-caprolactone



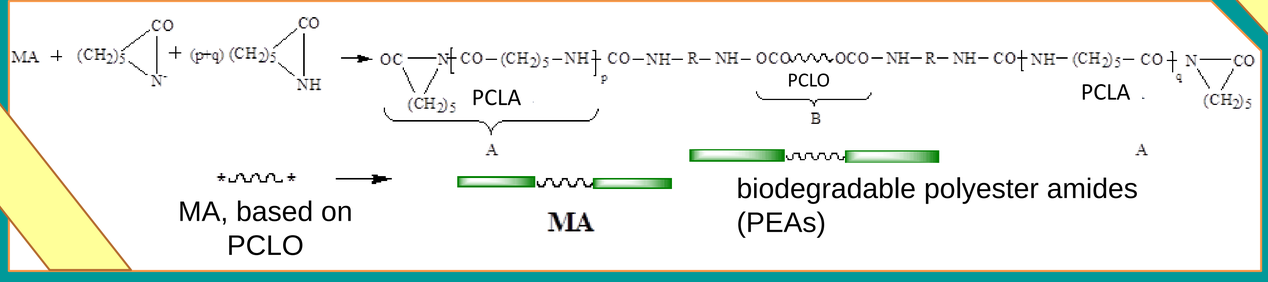
polyester amides



Synthesis of MA

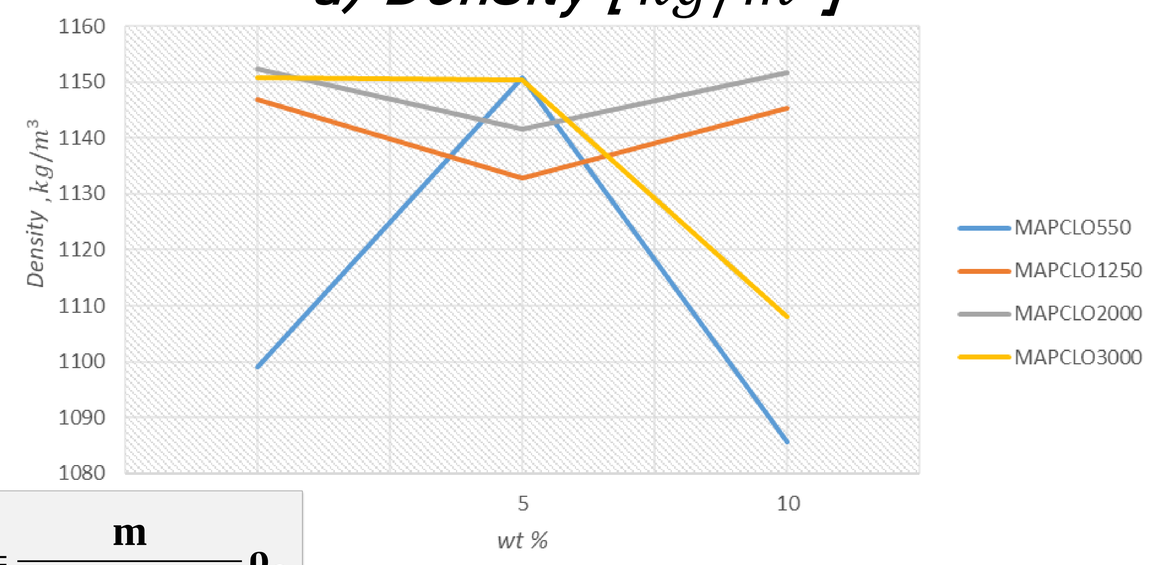


Synthesis of P[(CLA) -co-(CLO)] copolymers



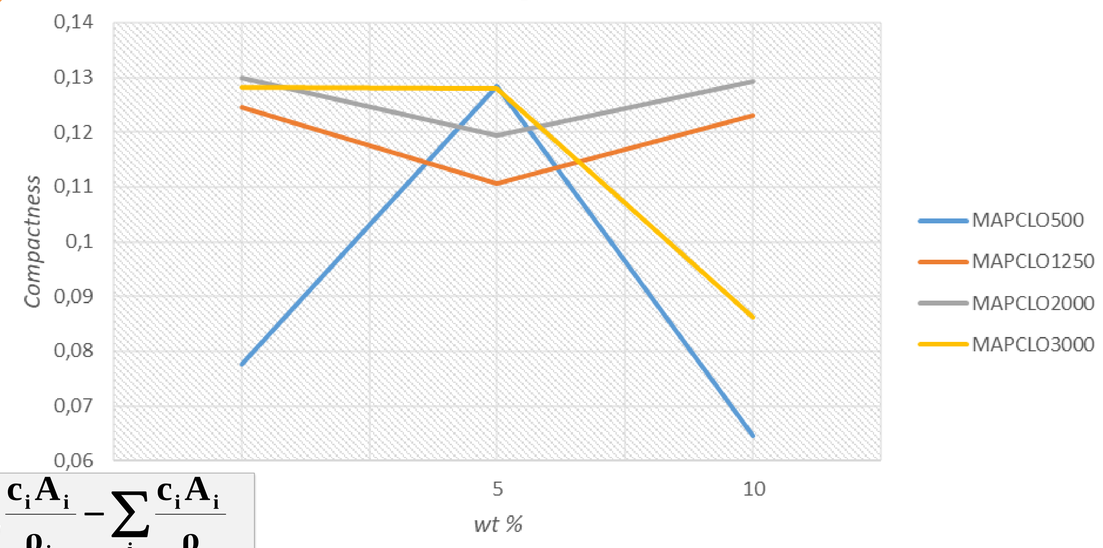
Functions

a) Density [kg/m^3]



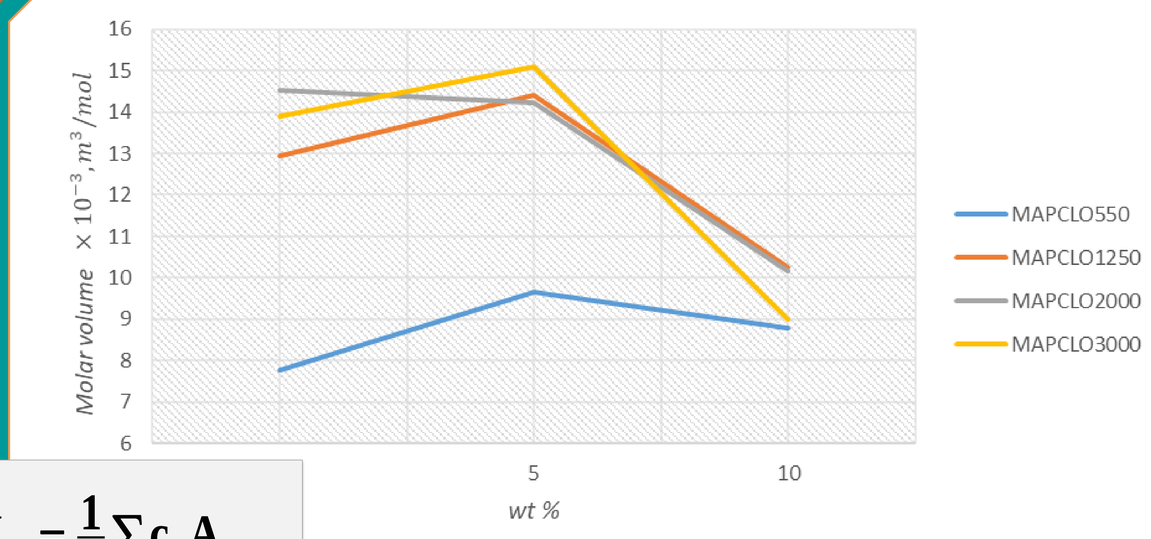
$$\rho = \frac{m}{m + m_1 - m_2}\rho_0$$

b) Compactness



$$\delta = \frac{\sum_i \frac{c_i A_i}{\rho_i} - \sum_i \frac{c_i A_i}{\rho}}{\sum_i \frac{c_i A_i}{\rho}}$$

c) Molar volume [m^3/mol]



$$V_m = \frac{1}{\rho}\sum_i c_i A_i$$

Acknowledgments:

Financial support by UCTM through Science and Research Program 2020 is acknowledged. Project number №11964.