Summary of doctoral dissertation entitled:

Kinetics of Ring-Opening Polymerization of Lactones and Epoxides at Various Thermodynamic Conditions

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The main goal of the dissertation was to verify the research hypothesis that the application of a high-pressure activation method may allow the development of completely new ecological methods of lactones and epoxy resins polymerization. The first example of the systems investigated were poly(ε-caprolactone) (PCL), which is a biocompatible and biodegradable polymer, a representative model of the aliphatic polyester group. Whereas the second one is an epoxy resins based on Bisphenol A diglycidyl ether, valued in many industrial applications for their desirable mechanical, physicochemical and thermal properties and extraordinary resistance to external factors.

The results obtained in the course of this study, unique on a global scale, significantly broaden the knowledge about the kinetics of ROP, activated by *'external'* factors, i.e. using solely high-pressure or multiactivation approaches. The implementation of these synthetic strategies offers numerous benefits, including: *(i)* the possibility of obtaining well-defined telechelic α-hydroxy-ω-carboxy-poly(ε-caprolactones) with good structural macromolecular characteristics, *(ii)* the possibility of simplifying of the reaction system composition, i.e. using only monomer and water under high-pressure conditions, *(iii)* the reduction/eliminations of side reactions, e.g. inter- or intramolecular transesterification reaction, leading in case of ROP to the formation of cyclic polymers, *(iv)* increase of thermal stability of the organocatalyst, *(v)* obtaining new initiator/catalytic systems by a pressure-induced shifting of the reaction equilibrium towards the protonated form of DBU.

In conclusion, the following dissertation demonstrated that the proposed synthetic strategies based on high-pressure are pro-ecological methods of obtaining both polyesters and epoxy resins which in a way fulfill the requirements of the so-called *"green chemistry"*, resulting in materials of extraordinary purity. In addition, the following dissertation presents procedures allowing for precise real-time tracking of the kinetics of processes carried out in high-pressure conditions with the use of Broadband Dielectric Spectroscopy as well as High Pressure Scanning Transitometry. Especially in the case of the latter method, the development of an innovative experimental methodology, as well as the analysis of the obtained data, made it possible for the first time to use it to study the reaction of polymerization with epoxide ring-opening, under high-pressure conditions.