Biodegradable polymeric materials provoke great interest both in the groups of scientific and research as well as companies, mainly due to environmental and economic reasons. Year by year, the amount of plastic waste in landfills is increasing and their long-term degradation is not conducive to sustainable development of the natural environment, which is why, for example, biodegradable aliphatic polyesters are more and more popular, replacing traditional polymers from sources like oil or gas. However, the creation of innovative materials is associated with their continuous modification and refinement, thanks to which they will meet high application requirements. One of the common methods of modification is the mixing of polymers. Biodegradable polymer mixtures give a wide range of possibilities to obtain materials with properties that would not be possible using homopolymers without losing their biodegradability. However, changes in the properties of the final polymer blends, as a result of their simple mixing, may be disadvantageous or not observable at all. This is due to their thermodynamic incompatibility associated with the low energy of free enthalpy. In order to effectively mix two incompatible polymers, thus improving their functional properties and widening the scope of their use, it is necessary to introduce additional stimuli / factors, eg the use of organic peroxides. With their participation, under the influence of high temperature, we obtain free radicals, thanks to which it is possible: (a) to create copolymers of polymers used by combining two different macro-radicals; (b) cross-linking of individual materials; (c) degradation of material more susceptible to peroxides. The most preferred option is the formation of copolymers that will locate at the interface and act as a miscibility promoter. It is worth noting that the in-situ copolymers can be linear or branched and their structure depends on the conditions of dynamic cross-linking.

The aim of the proposed research project will be to modify the biodegradable aliphatic polyesters, as well as their mixtures, and to study the impact of organic peroxides used on their properties. Polymer blends will be obtained by a reactive extrusion process to improve their miscibility. As an adjuvant commercially available, various types of organic peroxides will be used. Their influence on biodegradable polyesters and their polymer mixtures will be examined by the use of scanning electron microscopy. In addition, the project will examine mechanical and thermal properties as well as intermolecular interactions at the interface in the mixtures obtained and the degree of crosslinking.

The results of project research have large cognitive significance in the area of exact and technical sciences. Scientific work will be carried out in the field of modern sciences, such as: engineering of biodegradable polymeric materials, technology of plastics processing. The expected results of the project may contribute to broadening the current state of knowledge mainly in the field of polymer material engineering, development of scientific and experimental basis of the above-described method, and are the basis for a better understanding of the process of modification and refinement of biodegradable polymer materials through dynamic cross-linking. This method is characterized by intensive development, modernity and large perspectives in the polymeric materials industry. The advantages of this method are the price and simplicity of obtaining new polymer mixtures with the desired properties, compared to the synthesis of new types of materials.