

Functional substances are added to polymeric materials in order to obtain materials with lower production costs and specific mechanical properties (thanks to the addition of fillers), as well as with the desired resistance to degrading factors (thanks to stabilizers). According to literature reports, raw materials of plant origin, including agricultural waste from food production, can act as natural fillers and stabilizers. Agro-waste added to polymers can act as a filler due to its content, among others: cellulose and its derivatives. The stabilizing effect of plant additives in polymeric materials is related to the presence of polyphenolic compounds. Polyphenols have strong stabilizing properties (including antioxidant properties), and under certain conditions they may also have a pro-oxidant effect, i.e. accelerating the degradation and aging processes of polymers. According to the literature, extracts and selected plant raw materials containing polyphenolic compounds were added to polymer compositions as stabilizers.

The aim of the project is to investigate the relationship between the content and type of polyphenolic compounds in plant raw materials (polyphenol profile) and the stabilizing (antioxidant) or prooxidative effect in polymer materials made on the basis of synthetic and biodegradable polymers.

As part of the project, agro-waste from food production, which will be added to polymeric materials, was selected for research. The research will be carried out using the experimental method, which will involve performing laboratory experiments. The general concept of the research involves determining the polyphenol profile (the content and type of polyphenols) and the antioxidant or pro-oxidant properties of plant waste. Then, selected plant waste will be incorporated into biodegradable and synthetic polymer compositions. Based on tests of the physicochemical properties of polymer materials before and after controlled aging, the impact of the polyphenol profile of the plant additive on the degradation process and biodegradation of polymer compositions will be analysed.

The research topic was undertaken due to the lack of available literature data on determining the correlation between the content and type of polyphenol compounds in plant raw materials (polyphenol profile) and the antioxidant or prooxidative effect of the plant additive in biodegradable and synthetic polymer materials. Moreover, it has not yet been determined how the content of individual polyphenolic compounds (acids, flavonoids, anthocyanins, stilbenes and others) naturally occurring in the mixture of polyphenols in plant material affects the mechanisms of stabilization of polymer compositions.

The most important expected effect of the project is to expand and supplement the current state of knowledge. Research carried out as part of the project will provide new data on the mechanisms of action of natural mixtures of polyphenolic compounds as stabilizers or accelerators of the aging processes of biodegradable and synthetic polymers. The research carried out will expand the current body of knowledge by understanding the relationship between the polyphenol profile of plant waste products and their antioxidant or prooxidative properties in polymer compositions.