

Description for the general public

Active packaging is an innovative food technology where the packaging system plays an active role in food preservation, by extending its shelf-life, improving safety and maintaining food quality. The emerging technologies are now focusing attention on incorporating antimicrobial agents directly into polymer package. The resulting materials can be tailored to release substances at a given rate, with a positive effect on the packaged food, or can absorb undesired substances from food or from the internal atmosphere of the package. Addition of volatile antimicrobial agents into polymers is a technological challenge, because of evaporation of additives during melt processing of the polymer. Such challenge can be solved by incorporation of the volatile molecules within porous organic compounds to host guest molecules inside, like cyclodextrins, zeolites and the like, as we propose in this project.

The aim of the project is to produce a novel, antibacterial and biodegradable polymeric based system for production of environmentally friendly packaging materials. The polylactide-based matrix will be modified with D-limonene, a natural essential oil derived from citrus, which exhibits excellent antibacterial properties. The essential oil will be encapsulated in a porous chemical structure, namely cyclodextrins, to enhance D-limonene naturally poor thermal stability and enable its incorporation into polymeric matrix. Particular attention will be given to the study of interactions between the polymeric matrix and additives, and to the influence of natural essential oil on structural, thermal, mechanical and antibacterial properties of PLA.

Recent studies revealed that synthetic antimicrobial substances can produce toxic substances and carcinogens in human bodies. Hence, natural preservatives are gaining ground nowadays and their development is necessary to take full advantage of the food packaging materials with enhanced antimicrobial properties. The PLA-based films modified with encapsulated essential oils are fully sustainable, biodegradable and compostable, hence environmentally friendly. The proposed production path enables to design material properties according to specified consumer needs. The obtained materials for active packages with extended shelf-life will contribute to improvement of food preservation methods. This in turn, may contribute to increase savings and improve health care.