

Whey protein-based oxygen barrier

The Whey-layer project, funded by the European Commission's Seventh Framework Programme under "Research for SME-Associations", has come to its halfway point. The cooperative three-year industry driven research and development study aims to replace currently used synthetic oxygen-barrier layers with whey protein-based coatings in food packaging applications.

At this stage of the project, various samples of films have been produced: they consisted of whey protein-coated films and multilayer laminates composed of an intermediate layer of whey protein-coated on PET and then laminated with PE. After optimisation of the whey-based formulations, the testing carried out on these materials confirmed the initial motivation for the consortium of fourteen partners to do research towards the development of Whey-layer technology.

Common synthetic polyolefin films such as PE and PP are very good moisture barriers, but must be coated or laminated with synthetic polymers including EVOH and PVDC copolymers to provide an oxygen barrier. The resulting polymeric structures, while effective in minimising the permeation of oxygen, water vapour, and odour, are characterised by their poor reuse due to difficulties in separating each layer for its individual recycling. Results on the oxygen permeation properties of whey protein-coated plastic films met the initial goal and have confirmed that whey protein isolate coating solutions display very good oxygen barrier properties at low to intermediate relative humidity, comparable to synthetic oxygen barriers, thereby opening up the now actual potential of whey protein coatings for replacing existing expensive synthetic oxygen barrier polymers. Furthermore, results to date have demonstrated that Whey-layer-based films and laminates have mechanical properties that make them suitable for food packaging applications, and especially that the whey-based layer has an excellent adhesion on the substrate. In addition, active packaging solutions incorporating antimicrobials and antioxidants are being developed. Tests with various foodstuffs are ongoing to assess the performance of the Whey-layer material as a food packaging solution to protect packed goods against microbial contamination, or to retard their rancidity, in comparison with conventional material.

The future work of the consortium will focus on scaling up the results at lab and pilot scale in order to arrive at a commercially feasible technique for producing whey-coated plastic films, without jeopardising the performance needed in the food packaging sector, and while increasing the recyclability of these plastics.

The impact of this project will be considerable and embraces many issues: finding a value-added commercial use for currently discarded whey protein, replacing harmful petroleum-based plastics with a natural by-product which would safeguard the performance and enhance the recyclability of substrate film, enhancing the quality of the packed food and meeting growing consumer and political environmental concerns, thus adding huge value for EU packaging, food and dairy industries.

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