

Recent Developments in Electrospraying Assisted by Pressurized Gas for the Encapsulation of Challenging Bioactives

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This presentation will showcase several recent advancements developed within our research group, focusing on the use of high-throughput Electrospraying Assisted by Pressurized Gas (EAPG) for the encapsulation and drying of challenging bioactive compounds. This proprietary and innovative technology, introduced and patented by our team, relies on the atomization of a polymer solution containing the bioactive compound via a pneumatic injector. Compressed air is used to nebulize the solution within a high-intensity electric field. During this process, solvent evaporation occurs at room temperature inside an evaporation chamber, resulting in the collection of the encapsulated material as a free-flowing powder. Compared to conventional encapsulation methods, EAPG offers multiple advantages. It is a gentle, room-temperature process that preserves the integrity of sensitive compounds. It produces free-flowing particles with narrow size distribution, high encapsulation efficiency, exceeding 95%, without compromising the functional properties of the bioactives. It is highly versatile, accommodating a wide range of bioactive compounds and encapsulating materials. To date, this technique has been successfully applied to encapsulate complex bioactives such as omega-3 fatty acids, underutilized polyphenols and probiotics into various polymeric matrices, including water-soluble and gastroresistant materials. Accelerated oxidation tests confirmed the enhanced stability and extended shelf life of the encapsulated products. Furthermore, the process has been scaled up to meet industrial demands, achieving production rates of several kilograms per hour while maintaining the quality and characteristics of the encapsulated materials. The case studies presented here highlight the potential of EAPG technology as a scalable and efficient solution for the industrial delivery of challenging bioactive compounds, particularly in the development of functional food applications.

Keywords:

EAPG, omega-3 fatty acids, polyphenols, probiotics, encapsulation, industrial scale, functional foods.

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