

# Aerogel particle production via the emulsion-gelation method

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Due to their large surface area, aerogels can be efficiently used in the development of functional food and in pharmaceutical formulations as carriers for minor components and active ingredients [1, 2]. A wider range of potential applications in gas treatment, humidity control and other areas can also be foreseen.

To fulfil requirements of many potential applications aerogels should be often prepared in the form of round (micro)particles of a specific size.

The idea that a gelling system (sol) may be shaped into spherical particles underlies the so-called emulsion gelation method. In this process the gelation reaction takes place in a continuous phase (oil) that is immiscible with the sol. Continuous stirring and surfactants keep the sol dispersed and once the stable emulsion is formed the gelation is triggered either chemically or physically. The resulting gel particles of micrometer sizes (0.5 – 200 µm) should be recovered, solvent exchanged (if needed) and supercritical dried. The emulsion gelation process is exemplified by various gelling systems such as polysaccharides (alginate, chitosan, starch, ... ) [3–5] and silica [6].

This contribution briefly presents fundamentals of the emulsification process, focuses on the state of the art of the emulsion gelation and discusses the process scalability. Own results for the ionotropic emulsion gelation of alginate are presented with emphasis on the key process parameters and their influence on the particle size. Possible integration with subsequent process steps (solvent exchange and supercritical drying) is outlined.

*Acknowledgement: This project has received funding from the European Union's Horizon 2020 research and innovation program under grant agreement No 685648*

- [1] K.S. Mikkonen, K. Parikka, A. Ghafar, M. Tenkanen, Trends Food Sci. Technol. 34 (2013) 124–136.
- [2] C.A. García-González, M. Alnaief, I. Smirnova, Carbohydr. Polym. 86 (2011) 1425–1438.
- [3] E.E. Hassan, R.C. Parish, J.M. Gallo, Pharm. Res. 9 (1992) 390–397.
- [4] C.A. García-González, J.J. Uy, M. Alnaief, I. Smirnova, Carbohydr. Polym. 88 (2012) 1378–1386.
- [5] M. Alnaief, M.A. Alzaitoun, C.A. García-González, I. Smirnova, Carbohydr. Polym. 84 (2011) 1011–1018.
- [6] M. Alnaief, I. Smirnova, J. Supercrit. Fluids 55 (2011) 1118–1123.