# DEVELOPMENT AND CHARACTERIZATION OF PROTEIN NANOHYDROGELS FOR FOOD APPLICATIONS

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One of the present challenges in food engineering is the development of safe bio-systems that can protect, carry and deliver functional food components; this can be achieved using natural polymers. Protein-based nanogels have attracted considerable attention due to their non-toxicity and small dimension with a large interior network for multivalent bioconjugation, which offers several possibilities for the encapsulation of functional components by covalent attachments. Interactions between natural biopolymers, such as peptides or proteins, under specific conditions (e.g. pH, temperature, ionic strength and concentration) originate nanohydrogels that can exhibit improved functional properties in comparison to the proteins alone. The aims of the present work were to evaluate the ability of Lactoferrin and Glycomacropeptide (GMP) to form nanohydrogels. In a first stage, the electrostatic interactions between Lactoferrin-GMP were monitored by Quartz Crystal Microbalance (QCM) and a frequency decrease was observed, indicating the adsorption of Lactoferrin on GMP adsorbed surface. Subsequently, Lactoferrin and GMP nanohydrogels were produced at pH 5.8 with different concentrations (0.02, 0.1 and 0.2 % (w/v)), subjected to different temperatures vs time (60, 70 and 80 ºC for 10, 30 and 60 min) and were evaluated in terms of size distribution (hydrodynamic diameter), polydispersity and zeta potential by dynamic light scattering (DLS), turbidity measurements (UV-Vis spectroscopy at 600 nm), morphology through Transmission Electron Microscopy (TEM) and Atomic Force Microscopy (AFM). The increase in temperature and the decrease in concentration resulted in nanohydrogels with the lower values of hydrodynamic diameter (from 600 to 179 nm) and polydispersity index (from 0.499 to 0.080). This research provides important information on the effect of specific conditions (e.g. temperature, concentration, ionic strength) in the development of Lactoferrin-GMP nanohydrogels and can be useful for the design of e.g. nano-structures for food and also pharmaceutical applications.
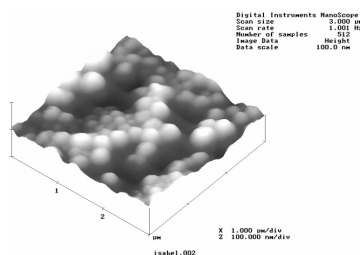


Figure 1. AFM image of the lactoferrin-GMP nanogels

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