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## Development of multilayer nanocapsules through layer-by-layer deposition of chitosan and fucoidan

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Layer-by-Layer (LbL) assembly is based on the electrostatic interaction between oppositely charged polyelectrolytes alternatively adsorbed onto an appropriate template. Nanocapsules prepared through LbL can be specially engineered with controlled sizes, composition and functionality, and can be used as carriers for bioactive compounds. Chitosan, a cationic polysaccharide with antimicrobial activity, and fucoidan, an anionic sulfated polysaccharide with various bioactive properties (such as antioxidant activity) are candidates for the formation of functional multilayers.

The present work aims at developing biodegradable hollow nanocapsules through LbL assembly of chitosan and fucoidan. Nanocapsules were built through the alternate deposition of 10 chitosan/fucoidan layers on polystyrene (PS) nanoparticles (diameter ≈ 100 nm), used as templates, followed by removal of the PS core.

The obtained multilayer nanocapsules were characterized by means of dynamic light scattering (DLS) (size and zeta potential), quartz crystal microbalance (QCM) measurements, Fourier transform infrared (FTIR) and scanning electron microscopy (SEM).

Zeta potential values indicated the stepwise deposition of chitosan and fucoidan alternating layers on the PS nanoparticles. The real-time build-up of chitosan and fucoidan nanolayered assemblies was monitored by QCM and a frequency decrease was observed after each polyelectrolyte deposition, indicating that mass was being deposited, and also the adsorption equilibrium was attained and stable layers were obtained. DLS measurements and SEM showed that the size of the nanocapsules is in the order of a few hundreds of nanometers. The removal of the PS templates from the core-shell particles was confirmed by the disappearance of the characteristic bands (at 3000-3103, 756 and 698 $cm^{-1}$) of the PS residue in the FTIR spectrum.

Chitosan/fucoidan capsules are envisaged as a nanocarrier system for e.g. oxidation-sensitive active compounds, which would benefit from the shelter provided by the capsules. Such systems have possible applications in food and pharmaceutical industries.