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Title: Coating Strategies for Biopolymer Aerogels

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ABSTRACT (Space limited to 2200 characters)

Due to sustainability aspects, high availability, biocompatibility and non-toxicity of educts, research on biopolymer- based aerogels has seen significant increased importance in the last decade. While biopolymer aerogels show high potential in various applications (e.g. in adsorption and separation processes, as high performance thermal insulation materials and carrier matrices for targeted drug delivery), their use poses challenges in handling and storage: high polarity (in case of polysaccharide gels) and open-porous structure (for all biopolymer aerogel types) makes them especially susceptible to moisture, that can penetrate into the pores resulting in changes of the internal surface and pore collapse. Since storage and aging behavior are crucial properties, strategies for aerogel protection are of high relevance. In this work, aerogels are produced from alginate and cellulose in form of different shapes (particles and monoliths) and afterwards post-modified via spray coating in a spouted bed and via cold plasma coating. In spray coating, moving aerogel particles were brought in contact with dispersed coating solutions, which formed homogeneous shellac films on the top of the particles surfaces. A broad spectrum of process conditions (e.g. shellac concentration in solution, spray rate, ration aerogel/coating solution, particles with different densities and surface morphologies) was assessed by screening in a miniaturized spouted bed and by acoustic levitation of single particles. Ideal conditions for production of coated particles with controllable coating layer thicknesses were determined and it was unambiguously demonstrated, that the inner porous structure of aerogels remained intact during the coating process. Cold plasma coating allowed the nanometer-precise application of hydrophobic and superhydrophobic polymer layers on aerogels surfaces. We demonstrated the possibility to achieve water repellen hydrophobic to superhydrophobic surfaces on hydrophilic and open porous aerogels with high surface areas, by application of fluorocarbon layers. In addition, a positive contribution of the process to the overall specific surface area was determined.