Starch aerogels and aerogel-like xerogels for drug delivery

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Résumé

Aerogels based on polysaccharides (bio-aerogels) are versatile materials that have potential to be used in life science applications such as pharmaceutics, cosmetics, food and bio-medical. For example, bio-aerogels can be used as a matrix for controlled delivery of drugs.
In this work, different starches were dissolved and materials in different forms – alcogels, aerogels and low-vacuum dried materials (named xerogels) – were designed and tested as carriers of theophylline. The influence of starch amylose/amylopectin ratio, concentration in solution, retrogradation time and drying method (supercritical CO2 drying for aerogels, low-vacuum drying for xerogels) on materials' density, specific surface area and morphology was investigated. Starch alcogels were loaded with theophylline via impregnation; loading capacity and efficiency of alcogels, aerogels and xerogels were determined, and release of the drug from xerogels and aerogels evaluated.

Two remarkable phenomena were obtained: 1) low-vacuum drying method resulted in starch aerogel-like materials, i.e. xerogels were with low density and specific surface area above 100 m2/g, and 2) starch alcogels were adsorbing theophylline from ethanol resulting in loading efficiency as high as 250 %. The results obtained show a new pathway in making aerogel-like polysaccharide materials without drying in supercritical conditions for potential use as drug carriers.

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