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Cellulose aero/xerogels for moisture sorption.

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Abstract
In everyday life, the humidity of the air and thus the moisture content of matters have a profound influence on our comfort and the ability to utilise materials. The possibilities for regulating and/or absorbing moisture is therefore highly interesting. Cellulose aero/xerogel particles are here an interesting material, due to its high capability of directly adsorbing moisture by its large content of hydroxyl groups. In general, the number of hydroxyls and acidic groups, as for instance carboxylic acid groups, control moisture adsorptivity in these types of materials. In order to produce cellulose aero/xerogel particles the cellulose is dissolved in alkali and then regenerated in a coagulation bath. Utilising the jet-cutter technique the production of regular, small gel particles in large quantities is possible. By blending the cellulose with quantities of charged polysaccharides the sorption capacity as well as the stiffness of the particles may be regulated. Of importance is the coagulation which may be made in a media which not causes crystallization of the cellulose thus ensuring its high moisture sorbing capacity. The gel particles may be dried either by super critical CO_2 producing aerogels or just in air producing xerogels. It is here demonstrated that although aerogel particles have an enormously larger specific surface area than the xerogel particles the moisture sorbing capacity is almost the same. This is due to the fact that moisture adsorptivity is only controlled by the available number of sorption sites on the molecular scale. It is also shown that the cellulose xerogel particles maintain their sorption capacity and mechanical stability for a number of humidity cycles, i.e. they stay in their amorphous form and are not recrystallizing due to the exposure to moisture. The relation between the composition and properties of these xerogel particles is further dealt with.

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