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Influence of coating and wetting on the mechanical behaviour of highly porous cylindrical aerogel particles

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Abstract

Aerogels are ultra-light open porous materials with a high specific surface area. Because of their outstanding properties they can be used in a diverse range of pharmaceutical processes. In this work the mechanical behaviour of the highly porous aerogel particles having a cylindrical shape was studied with single particle compression and impact tests. The alginate-starch aerogels were produced as cylindrical particles with the help of CO₂ induced gelation followed by supercritical drying and coated in the fluidized bed with a pharmaceutical polymer Eudragit[®] L 30 D-55. Affinity of water to original and coated aerogels was measured at acidic (pH 1.2) and neutral (pH 7.4) conditions. The influence of the ambient air humidity on the wetting of the aerogel particles was investigated for the range of 0-80 % RH. Results indicate that with increasing moisture content of the uncoated aerogels the particle shrinking and the microstructure change take place. Their deformation behaviour changes from dominantly plastic for dry particles to elastic and stiff for wet particles. After coating the aerogel particles exhibit elastic and stiff behaviour. The Eudragit[®] layer protects well the aerogel structure up to a relative humidity of 50 %.

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