Functional Cellulose Microspheres For Pharmaceutical Applications

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Dissolving cellulose is the first main step in preparing novel cellulosic materials. Since cellulosic fibres cannot be easily dissolved in water-based solvents, fibres were pretreated with ethanol-acid solution prior to the dissolution. Solubility and changes on the surface of the fibres were studied with microscopy and capillary viscometry. After the treatment, the cellulose fibres were soluble in alkaline urea-water solvent. The nature of this viscous solution was studied rheologically.

Cellulose microspheres were prepared by extruding the alkaline cellulose so-

lution through the needle into an acidic medium. By altering the temperature and acidity of the medium it was possible to adjust the specific surface area and pore sizes of the microspheres. A typical skin-core structure was found in all samples. Microspheres were oxidised in order to introduce anionic carboxylic acid groups (AGs). Anionic microspheres are more hydrophilic; their water-uptake increased 25 times after oxidation and they could swell almost to their original state (88%) after drying and shrinking. Swelling was studied in simulated physiological environments, corresponding to stomach acid and intestines (pH 1.2-7.4).

Oxidised microspheres were used as a drug carriers. They demonstrated a high mass uniformity, which would enable their use for personalised dosing among different patients, including children. The drug was solidified in microspheres in amorphous form. This enhanced solubility and could be used for more challenging drugs with poor solubility. The pores of the microspheres also remained open after the drug was loaded and they were dried. Regardless of the swelling, the drug was released at a constant rate in all environments.