

Research News

Starch and Cellulose Chemistry and their Products

Agrotechnology and Food Sciences Group aims at developing new processes and products based on carbohydrates via chemical, physical or enzymatic modification. Processes are developed to enhance reactivity and reduce the use of chemicals and solvents and improve product performance. Applications are found in the non-food area.

Introduction

Starch and cellulose are natural polysaccharides, abundantly available on a commercial scale. Both semi-crystalline polymers consist of the monomer glucose. The properties of the two polymers differ largely. Native starch can be dissolved in water. Unmodified cellulose fibres are insoluble in water. The properties of starch and cellulose depend on the way the glucose monomers are linked. Starch and cellulose are excellent renewable resources suited for the development of industrial products.

Traditional applications

Cellulose fibres are mainly used in the paper industry. The paper of this leaflet consists mainly of cellulose fibres and inorganic fillers. But also cationic and oxidised starches are used. Both carbohydrate polymers are used in many other non-food applications. Cellulose is also used in plastics, fibre enforced products and composites. Two widely used cellulose derivatives are carboxymethyl cellulose and cellulose diacetate, which find uses in pharma, food, personal care, detergents and textile. Other non-food markets of starches are adhesives, coatings,

paper, textile, drilling fluids, pharma and bioplastics.

Expertise and technology

At Agrotechnology and Food Sciences Group research on polysaccharides is directed towards the development of new derivatives and products. Technologies like fluid bed, emulsion polymerisation, spray drying, sc-CO₂, (reactive) extrusion and batch wise production are used to introduce new functionality's. Examples are:

- bleaching boosters for paper
- new dry starch oxidation process
- complexation agents
- reactive starches
- co-builders from oxidised starch
- super-absorbents
- custom-made products
- sub-micron particles
- nanofoams
- interpenetrating networks
- controlled release systems

At Agrotechnology and Food Sciences Group, researchers possess fundamental know-how on polysaccharides and new technologies. Both are needed in the successful

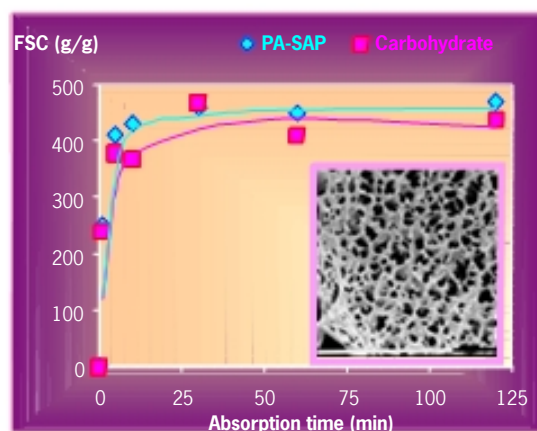
development of new processes and products. They assist companies in making choices and develop products exclusive for customers.

Equipment

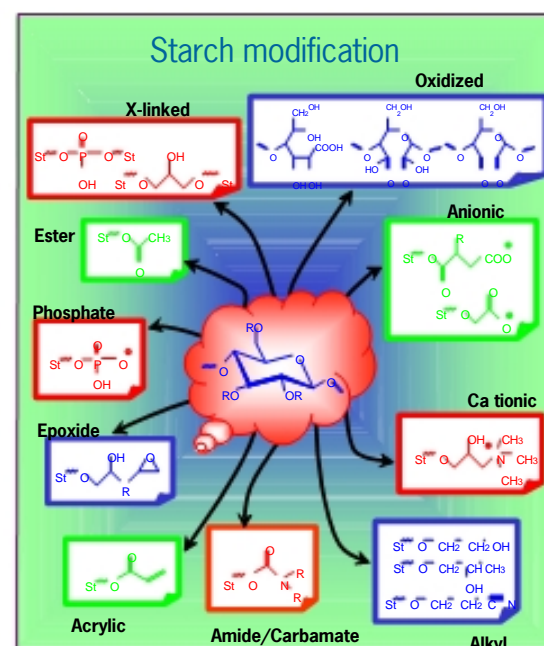
At Agrotechnology and Food Sciences Group, the infrastructure is well suited for product and fundamental research on starch and cellulose. Numerous analytical tools are available such as FT-IR and multi-D NMR, incl. solid state and imaging, spectroscopy, X-ray diffractometry, HPLC systems incl. Dionex, paper quality testing equipment, SEM (low/high vacuum), and many more.

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Water absorption of a carbohydrate based supersurper (SAP) compared to a commercial polyacrylate SAP. The inset is a cryo-SEM picture of the highly porous structure of a renewable SAP.



Traditional and novel ways of starch chemical modification. Amongst the novel starches are epoxy, amino and acrylic starch.