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VABILO NA PREDAVANJE
V OKVIRU DOKTORSKEGA ŠTUDIJA
KEMIJSKE ZNANOSTI

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z naslovom:

From native starch granules to advanced starch complexes: structural features, properties and applications

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Povzetek:

Native starch granules when exposed to high temperatures in water gelatinize (melt), swell extensively and bind large amounts of water. Because of this property, starches often function as gelling agents, thickeners or moisture retention agents in processed food products. However, the food industry poses high demands on starch properties and native starches by far do not fulfil all the requirements. Genetic engineering, hydrothermal treatments and chemical modifications can be used to obtain starches with desired functionalities.
For use in instant and ready-to-use-applications where heating is not desired, starches of enhanced cold-water swelling capacity are desired. An elegant way to impart cold-water swelling properties to starch is to heat native starch to sufficiently high temperatures in the presence of water and ethanol [1,2]. This treatment results in a changeover from granules with native crystals composed of starch double helices to granules which have crystals, composed of single helical starch. These granular cold water swelling starches (GCWSS) dissolve in water at ambient temperature.
Interestingly, it was found that certain lipophilic components can be inserted very efficiently as guest molecule in GCWSS single helices at ambient temperature with new functionalities as a result. For instance, ascorbyl palmitate (AscP) was successfully inserted as a guest compound in maize and potato GCWSS and lead to an increased oxidative stability. Furthermore, whereas the parent GCWSS formed undesirable lumps upon contact with water, the GCWSS-AscP inclusion complexes formed homogenous dispersions [3].
The development of GCWSS and inclusion complexes thereof to a large extent relied on thorough studies of the (nano)structural transitions of these substances under processing and application relevant conditions. It will be demonstrated how time resolved synchrotron X-ray based scattering experiments can be used to reveal the structural changes associated with starch gelatinization and gelation at high temperatures in the presence of flow [4]. Also the kinetic and mechanistic aspects of the conversion from native starches to GCWSS in the presence of superheated aqueous ethanol will be discussed. The quality and properties of GCWSS depend on the starch botanical origin.

References

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