

园艺与食品科学

水分含量对玉米淀粉颗粒结晶度的影响

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摘要 应用X-射线衍射方法对不同水分含量的玉米淀粉颗粒的结晶度进行了研究。只有在玻璃态情况下,淀粉的无定型区域才产生X-射线衍射图样,衍射峰的强度、面积在某种程度上依赖于淀粉的含水量。玉米淀粉颗粒的X-射线衍射图形是由两部分组成的:微晶区域和无定型区域。随着水分含量的增加,样品的结晶度从小到大,并达到一个平衡值(约45%)。室温下,当水分含量处于低水平时(小于11.25%),玉米淀粉颗粒中的无定型区域处于玻璃态,衍射图形显示的是微晶区域和无定型区域两部分的衍射图形的综合。当水分含量处于较高水平时(大于18.55%),淀粉颗粒中的无定型区域处于橡胶态,其X-射线衍射图形仅由微晶区域形成。在较低水分含量时(小于18.55%),由于塑化作用的影响,增大含水量会导致更多的微晶的形成。当水分含量超过18.55%之后,再增大水分,就会导致微晶片层和剩余的无定型片层的同时分解。

关键词 [玉米淀粉](#) [微晶结构](#) [X-射线衍射](#) [含水量](#) [结晶度](#)

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The Influence of Water Content on the Crystallinity of Maize Starch

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Abstract

X-ray diffraction method has been used to study the crystallinity of maize starch with different water content. The amorphous regions of starch granules have been shown to produce X-ray diffraction patterns only if they are in a glassy state, the intension and areas of the peaks to some extent being dependent on the water content of the starch. The X-ray diffraction pattern of maize starch granules was constituted of two parts: micro crystal regions and amorphous regions. The crystallinity of starch increased with the increase of water content, and attained equilibriums worth (~45%). The X-ray diffraction pattern of maize starch, which has in a low water content level (<11.25%) at room temperature, was represented as the sum of the patterns obtained from crystal regions and amorphous regions, the amorphous region of the starch granule was in the glassy state. The amorphous region of starch granules, which has a high water content level (>18.55%), was in a rubbery state and the crystal region contributed the pattern only. At lower water contents (<18.55%), increasing the water content in starch must result in forming more micro crystal, due to the plasticizing effect of water. When the water content exceed 18.55%, enlarge the water content again, the micro crystal slice and the amorphous regions, which remained in the glassy state, while be resolved at the same time.

Key words [maize starch](#) [crystallitic construction](#) [X-Ray diffraction](#) [water content](#) [crystallinity](#)

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