Phase Transitions in Amylose and Amylopectin Under the Influence of Ca(OH)$_2$ in Aqueous Solution

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Amylose (A$_1$) and amylopectin (A$_2$) are the two main constituent substances of most starches (75-80% in dry cornstarch). Endosperm of corn kernel contains, in general, 28% A$_1$ and 72% A$_2$. During cooking of corn starch in food preparation, specially those solved in water, the mixture of A$_1$ and A$_2$ experiences a phase transition from a pasty and weak-tied wet masa to a completely consistent dry material (gelatinization). Cooked corn tortillas, from dough prepared with 0.25% of Ca(OH)$_2$ in weight (Mexico and Central America), have better mechanical, structural and rheological properties, beside a more accepted flavor. In order to understand the mechanism of phase transformation of wet dough of corn starch under the Ca(OH)$_2$ presence, A$_1$, A$_2$ and 28%A$_1$+72%A$_2$ (A$_3$) samples were prepared with and without Ca(OH)$_2$, which afterward were boiled. During this process part of Ca is incorporated in cooked samples. X-ray diffraction (XRD) analysis and thermal diffusivity ($\alpha$) measurements were carried out in six samples: Three including Ca(OH)$_2$ and other three without it. Thermal diffusivity data were achieved by means of a photoacoustic system. XRD patterns show a more structured material when Ca$^{2+}$ is present in the molecular structure of material. $\alpha$ data evidence an increase when Ca$^{2+}$ is present in A$_1$ and A$_2$ samples, however, improves notably for the A$_3$. This result can indicate that Ca$^{2+}$ enhances the crosslinking of polymeric chains, contributing to a better heat conduction.

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