再録　報文

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Dual mode diffusion and sorption of sodium chloride in pre-cooked potato (Solanum tuberosum L.)

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Abstract

For cooked potato, we report maximum showing variations of the Fick's diffusion coefficients, D, of NaCl with total salt concentration, C_t, in the foodstuff in the temperature range, 30-98 ℃. The variations were successfully explained with the dual mode diffusion and sorption theory, which has been successfully applied to the diffusion of NaCl in cooked Japanese radish, solidified egg white, and pork meats. The original theory (Komiyama & Iijima, 1974) was revised by changing the definitions of the parameters for the presence of liquid water droplets in the foodstuffs. The sorption isotherms, being found to be almost linear with very slight concave upward curvatures, were explained by invoking the presence of the droplets. Two thermodynamic diffusion coefficients, D_T(p) and D_T(L), of NaCl of the partition and Langmuir type sorption species, respectively, in the diffusion rate determining region were estimated for the temperature range. The temperature dependences were found to show definite rises in the range of 50−70 ℃, suggesting the presence of a transition in the diffusion environment.

要旨

私たちは、30−98 ℃における加熱じゃがいも中のNaClの拡散係数Dが、全塩濃度C_tに対して極大を持つ変化を示すことを報告した。この変化は二元収着拡散理論でうまく説明できたが、この理論は今までに加熱大根・凝固卵白・豚肉にも適用することができた。食材中には液体水滴が存在するので、元の理論（小見山、飯島、1974）を改めパラメータの定義を変えた。収着等温線は殆んど直線に近く僅かに上に凸の曲線であったが、この水滴の存在により説明することができた。D_T(p) と D_T(L) はそれぞれ、拡散の律速段階領域におけるラングミュアー型および分配型の種のNaClの熱力学的拡散係数を表すが、それぞれの温度範囲において評価された。これらの値は温度依存を示し、50−70 ℃の範囲において明らかな上昇を見せ、拡散環境において転移が存在することが示唆された。