
Ohmic heating - design and performance of volumetric cooking, baking and preservation processes

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Ohmic heating is an alternative technology for thermal food processing based on the direct application of electrical current to food, which results in a rapid and volumetric heating of products. Benefits are derived from short heating times, improved heating uniformity as well as targeted and lower energy consumption. Application areas are the thermal preservation of high viscous and particulate foods, the heating or cooking of solid foods as well as the baking of dough. However, successful application requires the design of tailored processing conditions as well as the consideration of the product formulation. There is a need for further concepts to improve the treatment uniformity with special attention to tissue structure of raw materials and structural changes during the heating process, heat losses and cold spot location as well as the impact of process parameters related to treatment chamber design or the applied frequency. The presentation will point out key considerations concluded from case studies in ohmic baking, cooking of vegetables as well as preservation of high viscous foods. The results from the conducted studies reveal a high potential for commercial ohmic heating applications, particularly for time and energy reduction. In case of ohmic baking of gluten free bread, improved quality and functional properties could be shown while dramatically reducing the baking time. For the cooking of vegetables, main benefits were quantified with regard to more rapid and uniform heating and improved textural characteristics. In case of sterilization applications, reduced temperature gradients resulted in improved product quality and the mitigation of the formation of processing contaminants. It will be demonstrated, that a careful selection and control of the process parameters and the product formulation as well as a further improvement of the treatment uniformity are crucial in order to fully benefit from the volumetric heating principle.