Study of Liquid-contact Thawing by Ohmic Heating

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ABSTRACT

Frozen meat needs to be defrosted before supply to the consumers. However, traditional thawing processes, such as air thawing or water-flow thawing, cannot provide high quality products. The major concerns are the long thawing time, darkening, drip loss, and so on. The objectives of this research were to develop the potential of a quick liquid-contact thawing method by applying ohmic heating, study the operating parameters, and compare the product quality with other thawing methods. Ground pork samples in different sizes (5x5x10cm3 and 5x10x10cm3) were frozen to -15oC ~ -18oC, and the liquid-contact thawing by ohmic heating was then conducted by passing electrical current through samples. The voltage gradient used in this study was 10V/cm, while the carrying liquid was 0.1 or 0.15% brine. Two multi-point thermal couples were inserted for determination of temperature profile during the process, and the electrical current was turned off as the temperature data at all points reached -2oC. Samples with different direction to the electrical field were also studied. The results showed that the thawing time could be reduced from 24 to 12 min as the brine concentration raised from 0.1 to 0.15%. The thawing process was found faster when the largest face of sample was perpendicular rather than parallel to the electrical field. Compared to the air or water-flow thawing, the liquid-contact thawing by ohmic heating consumed much less time. Temperature data showed that the temperature differences among all detecting points were 3oC at most, which indicated uniform thawing. There found no significant changes in sample color, pH and electrical conductivity of brine before and after thawing process, which indicated little oxidation and drip loss. Liquid-contact thawing by ohmic heating provided an excellent thawing ability and very good thawing quality. These results indicated the potential of a quick thawing method for the future development.

Keywords : ohmic heating ; thawing ; electrical conductivity ; frozen foods

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