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Section 16

Physical and mathematical principles of technological processes

Секція 16

Фізико-математичні основи технологічних процесів

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Фізика та професійна безпека

Application of electrophysical methods in the food industry

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Introduction. A promising alternative to traditional heat treatment of food products is the introduction of electrophysical methods, which allow improving technological processes in various branches of food production.

Materials and methods. The work considers electrophysical methods for processing food raw materials, as well as meat and dairy products. The following methods were used: microwave heating, electrocontact (ohmic) heating and pulsed electric field (PEF) treatment.

Results and discussion. Let us analyze the specified methods in more detail.

Microwave technology (microwave heating) provides effective cooking, heating, defrosting, pasteurization, sterilization or drying of products using electromagnetic waves. In this case, heat is generated directly inside the product due to the interaction of microwaves with polar molecules. The dielectric properties of the food material also play an important role in the conversion of microwave energy into thermal energy. That is, microwave radiation provides rapid and uniform heating, reducing the duration of the processing of dairy and meat products without deteriorating nutritional and organoleptic properties [1].

Of particular importance is ohmic heating, which is based on the passage of electric current through the product. Studies [2] have shown that this method allows pasteurization of products with a high content of solid particles without the risk of overheating the wall layers of the equipment. Ohmic heating allows processing with less loss of nutrients, since the time to reach the target temperature is reduced several times compared to tubular heat exchangers.

It is known that IEP is used for processing potatoes, chicory, meat and dairy products [3]. As a result of such processing, microorganisms are inactivated (and in this case there is no need to use preservatives), a longer shelf life of products is ensured and their quality indicators are maintained at high levels. At the same time, effective extraction of biologically active components from raw materials is ensured.

Conclusions. The use of electrophysical methods (microwave heating, electric contact heating and pulsed electric fields) in the food industry allows to intensify heat and mass transfer, reduce the duration of processing, increase the shelf life of products, and also preserve their nutritional value and high quality.

References

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