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Using high pressure generated from the freezing of water to store and process food

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ABSTRACT

Water freezing under constant volume conditions, commonly termed isochoric freezing, generates exceptionally high pressures due to the volumetric expansion associated with ice formation. At subzero temperatures readily accessible in standard freezers (e.g. −20 °C), pressures of hundreds of megapascals can be achieved which suppresses the freezing point for a portion of the water. First, we will explore how this process can be utilised to preserve food by keeping the meat non-frozen at freezing temperatures. This typically utilises the water freezing suppression phenomenon inherent in the process. Second, leveraging the high pressure generated by the process, we will describe experimental undertaken to use this process as a high pressure processing step for food. In the last part of this talk, we will discuss and provide recommendations on how the isochoric freezing process can be effectively controlled and the challenges in industry adoption.

KEY WORDS

Freezing, food, high pressure processing, supercooled water, isochoric

BIOGRAPHY

Wai is an Associate Professor and is currently the Head of the Department of Chemical & Materials Engineering at the University of Auckland. His research interest is in food process engineering and specializes in food dehydration. He is an Associate Editor for the journal Drying Technology published by Taylor& Francis. Wai also has expertise in CFD simulations applied across the food and processing industry. He is an IChemE Fellow.

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