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Frost formation modeling during the storage of frozen vegetables exposed to temperature fluctuations

A. Urquiola, G. Alvarez, D. Flick



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A. Urquiola^{a,b}, G. Alvarez^{a,*}, D. Flick^c

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^aIRSTEA, Génie des procédés frigorifiques, Antony, 1 Rue Pierre Gilles de Gennes, 92761 Antony, France

6

^bUniversidad de la República, Department of Applied Thermodynamic, J. Herrera y Reissig 565, 11300 Montevideo, Uruguay

7

^cUMR. Ingénierie, Procédés Aliments, AgroParisTech; Inra, Université Paris-Saclay, 91300 Massy, France

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9 **Abstract**

10 The quality of frozen vegetables is affected by temperature fluctuations during storage, when weight
11 loss and frost formation are generally observed. In order to predict frost formation during storage of
12 frozen vegetables, a numerical model consisting of a cylindrical container filled with frozen carrot
13 slices was developed. It was exposed to external temperature fluctuations. The parameters of the
14 model were identified by experimental measurements or found in the literature. The model was
15 validated using a set of independent experimental results that showed good agreement with the
16 simulated predictions. The model is able to predict air velocities, air and product temperatures and
17 local frost formation. It was used to show that the most important parameters affecting total frost
18 formation are the effective mass diffusivity and the convective heat coefficient within the container.

19 **Key words:** frozen food, macroporous media, heat and mass transfer, temperature fluctuations,
20 natural convection, frost formation.

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