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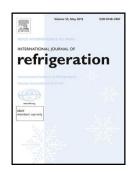
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Use of simple thermal conductivity models to assess the reliability of measured thermal conductivity data

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<Note: this paper is a modified version of a paper presented at the 4th IIR International Conference on sustainability and the cold chain>

Highlights:

- Simple models provide bounds for credible thermal conductivity values for foods
- These bounds can be implemented simply provided composition data is known
- Bounds should be used to check thermal conductivity data before publication or use

Abstract

Thermal conductivity data are important for modelling thermal processes and designing refrigeration systems. The literature contains a large number of data for food products, but many are questionable, whether due to typographical errors during publication, indirect measurement methods or inherent variability in the properties of the food itself. This paper describes a method by which the reliability of thermal conductivity data can be checked using simple thermal conductivity models and basic heat transfer theory, provided composition data for the foods is available, or may be assumed based on foods with similar composition. The method is applied to a variety of foods to serve as worked examples. It is recommended that these models be used to check the credibility of measured data before it is published, and also to check published data before it is used in any calculations.

Nomenclature

k	thermal conductivity (W m^{-1} K^{-1})
T	temperature (°C)
v	volumetric fraction