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Micro-scale thermography of freezing biological cells in view of cryopreservation

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Abstract

The aim of this work is to present a device for the measurement of biological living tissues during freezing by infrared camera. Under simplified assumptions, it is shown that InfraRed thermography measurements and two-dimensional microscale thermal processing methods of the temperature frames allow to estimate important thermophysical fields for the cryopreservation of living tissues, such as the heating source distribution of the latent heat in the media and the thermal properties released from biological cells during freezing.

This work is related to the analysis of thermal source terms occurring during freezing of biological tissues from the processing of experimental temperature fields obtained by infrared thermography. Such information is very important in order to understand and improve the heterogeneous solidification phenomena during cryopreservation processes.

A new method is proposed here in order to estimate the 2D mapping of source terms and thermal diffusivity during freezing. Such source terms (space and time distributions) are strongly related to the thermal diffusivity mapping which control the 2D in plane diffusion into the tissue.

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