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# Determination of one unknown thermal coefficient through the one-phase fractional Stefan problem

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## Abstract

We obtain explicit expressions for one unknown thermal coefficient (among the conductivity, mass density, specific heat and latent heat of fusion) of a semi-infinite material through the one-phase fractional Stefan problem with an overspecified boundary condition on the fixed face  $x = 0$ . The partial differential equation and a condition on the free boundary include a time Caputo's fractional derivative of order less than one. Moreover, we get the necessary and sufficient conditions on data in order to have a unique solution by using recent results obtained for the fractional diffusion equation given in: Roscani - Santillan Marcus, *Fract. Calc. Appl. Anal.*, 16 (2013), 802-815; Roscani-Tarzia, *Adv. Math. Sci. Appl.*, 24 (2014), 237-249 and Voller, *Int. J. Heat Mass Transfer*, 74 (2014), 269-277 by using the Wright and Mainardi functions. This work generalizes the method developed for the determination of unknown thermal coefficients given for the classical Stefan problem in Tarzia, *Adv. Appl. Math.*, 3 (1982), pp. 74-82 which are recovered by taking the limit when the order goes to one.

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