CFD analysis on the thermo-physical characterization of a PCM storage medium

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This study focuses on the computational and modeling approach for the design a “mesofluidic” device for the experimental measurement of the thermal conductivity of molten salts in the temperature range of interest of the salts. The proposed mesofluidic device takes its cue from a microfluidic device previously proposed in the literature by D. Kuvshinov et al. (Thermal conductivity measurement of liquids in a microfluidic device , D. Kuvshinov, M. R. Bown, J. M. MacInnes, R. W. K. Allen, R. Ge, L. Aldous, C. Hardacre , N. Doy, M. I. Newton, G. McHale, Microfluid Nanofluid (2011) 10:123-132 , DOI 10.1007/s10404-010-0652-x) for measuring the thermal conductivity of fluids at near ambient temperatures. The objective was to redesign the measurement cell, increasing its dimensions from a few hundred microns to few centimeters, identifying dimensions and materials suitable for its use in the temperature range of interest for molten salts, while still taking advantage of some principles already nurtured in the microdevice proposed in the literature, such as a high slenderness ratio of the measurement cell necessary to suppress any fluid motion induced by natural convection.

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