

Numerical and Experimental Investigation for
Heat Transfer in Triplex Concentric Tube
with Phase Change Material

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Abstract A numerical and experimental investigation of a thermal energy storage unit which involves phase change process dominated by heat conduction is presented. The thermal energy storage unit involves a triplex concentric tube with phase change material (PCM) filling in the middle channel. The hot heat transfer fluid (HHTF) flows in outer channel during charging process and the cold heat transfer fluid (CHTF) flows in inner channel during discharging process. A simple numerical method has been developed for the analysis of PCM solidification in the triplex concentric tube. An experimental apparatus has been built by which the effect of the inlet temperature and the flow rate of CHTF on the thermal energy release has been studied.

Key words phase change; energy release; concentric tube; heat transfer

CLC number TK124 **Document code** A **Article ID** 0529-6579 (2007) S1-0303-03

Although so many researchers focus on the problem of phase change of PCM, their

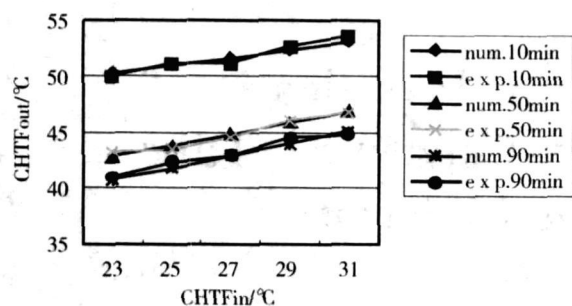


Fig. 2 Comparison of experiment and numeration during solidification

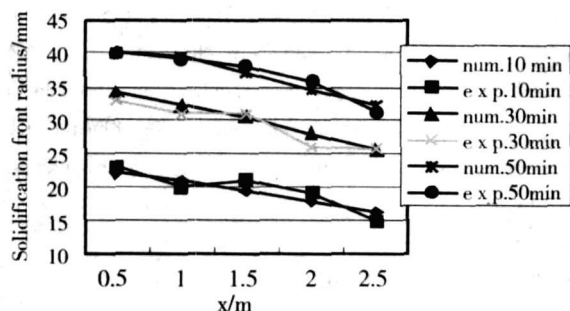


Fig. 3 Comparison of experiment and numeration during solidification

The minor discrepancies between the numeration and measurements can be ascribed to the measurements uncertainties and model simplifications. The obtained results show that the presented numerical procedure could be accurately used for transient heat transfer simulation in a triplex concentric tube latent thermal energy storage unit.

tion, as shown in Fig. 8.

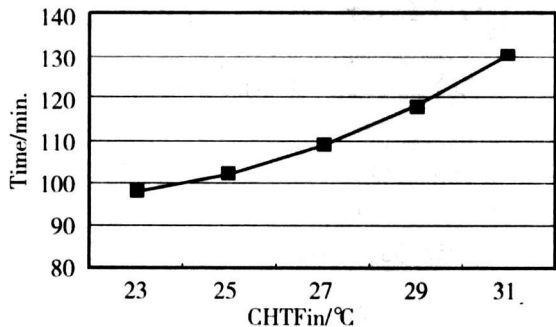


Fig. 7 Time for complete solidification

