

传递现象

圆管聚合物热流中黏性耗散分析的无网格模拟

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摘要 以与温度相关的指数定律作为本构方程, 应用无网格方法模拟了外表面为恒温时的圆管内具有黏性耗散的聚合物流动热传导问题, 给出了离入口不同位置处的温度分布。计算结果表明: 根据黏性耗散模型计算的温度比无黏性耗散模型高出64℃, 从而说明了黏性耗散在聚合物流动热传导问题中具有举足轻重的作用。并且, 无论是无黏性耗散模型, 还是黏性耗散模型, 其极限温度与壁面温度有很大的关系, 但与入口温度无关。

关键词 [热传导](#) [黏性耗散](#) [非牛顿流体](#) [聚合物流动](#) [无网格方法](#)

分类号

Meshless analysis on heat transfer with viscous dissipation in polymer flow in tube

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Abstract

This paper presents the results of meshless or mesh free analysis of a heat transfer problem of polymer melt flowing in a tube at constant ambient temperature. Here, the rheological behavior of the melt was described by a temperature dependent power-law model with viscous dissipation. Temperature profiles were obtained for different tube lengths. Comparing with the no viscous dissipation model, it was shown that the temperature-dependent viscous dissipation term had significant impact on the heat transfer, i.e., the temperature difference between the model with temperature-dependent power-law viscous dissipation and the model without viscous dissipation was about 64℃. Moreover, the limiting temperature profiles of both no viscosity dissipation model and temperature-dependent power-law model were influenced by the wall boundary, but not by the inlet conditions of the polymer melt.

Key words [heat transfer](#) [viscous dissipation](#) [non-Newtonian fluid](#) [polymer flow](#) [meshless method](#)

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