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论文

双扩散效应对室内VOCs对流扩散的影响

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摘要:

消除室内的挥发性有机化合物(volatile organic compounds, VOCs)须掌握其扩散和分布规律,根据不可逆过程热力学基本原理,考虑双扩散效应的影响,建立了三个物理量的梯度驱动下封闭空间内自然对流传热传质的数学模型.并采用数值方法研究了室内环境中同时存在温度梯度、湿度梯度和VOCs浓度梯度时的自然对流传热传质现象,着重分析了考虑交叉扩散效应时热瑞利数和浮力比数等对室内VOCs对流扩散的影响.在温度梯度和VOCs浓度梯度方向相同时,热扩散作用促进了VOCs的对流扩散.

关键词: 挥发性有机化合物; 双扩散效应; 传热传质; 自然对流; 数值研究

Influence of double diffusion effects on the convective diffusion of indoor VOCs

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Abstract:

In order to find the distribution of volatile organic compounds (VOCs) in buildings, based on the principle of thermodynamics of irreversible processes and the double diffusion effects, a mathematical model was developed based on the principle of thermodynamics of irreversible processes and the double diffusion effects, to effectively analyze the natural convective heat and mass transfer in the presence of three physical (temperature, VOCs and humidity concentration) gradients, and the mathematic model was numerically solved by the FEM method. The Soret effect and Dufour effect on the convective diffusion of VOCs in indoor surroundings was specially investigated. The average Sherwood number was graphically presented with various conditions.

Keywords: volatile organic compounds; double diffusion effects; heat and mass transfer; natural convection; numerical study

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