

传递现象

永磁梯度磁场布置方式对空气自然对流换热的影响

杨立军, 杜小泽, 杨勇平

华北电力大学电站设备状态监测与控制教育部重点实验室, 能源的安全与清洁利用北京市重点实验室, 北京 102206

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摘要

梯度磁场可用于控制非导电弱磁性介质的自然对流换热过程。利用钕-铁-硼永磁系统的不同空间布置, 构建了具有不同磁场强度分布的梯度磁场, 通过数值模拟得到了不同永磁梯度磁场的磁场强度和磁加速度。对不同梯度磁场作用下的二维封闭腔内的空气自然对流换热过程进行了数值研究, 获得了空气自然对流的流场和温度场, 以及壁面局部Nusselt数和平均Nusselt数并进行了比较。结果表明: 空气自然对流换热可以通过施加具有不同磁加速度的梯度磁场得到强化或控制。

关键词

[梯度磁场](#) [自然对流换热](#) [传热强化](#) [磁加速度](#) [数值模拟](#)

分类号

Influences of permanent gradient magnetic field configurations on air natural convection heat transfer

YANG Lijun, DU Xiaoze, YANG Yongping

Abstract

The natural convection heat transfer of electrically non-conducting fluids can be controlled by gradient magnetic field. The gradient magnetic fields with different profiles of magnetic field intensity were set up by various configurations of neodymium-iron-boron permanent magnet system. The magnetic field intensities and magnetic accelerations for differently configured gradient magnetic fields were obtained by numerical simulation. The natural convection heat transfer of air in a two-dimensional enclosure that was placed in different gradient magnetic fields was numerically investigated. The flow and temperature fields for the air natural convection were presented and the local and mean Nusselt numbers on the walls were calculated and compared. The results showed that the natural convection heat transfer of air can be enhanced or controlled by applying permanent gradient magnetic fields with different magnetic accelerations.

Key words

[gradient magnetic field](#) [natural convection heat transfer](#) [heat transfer enhancement](#) [magnetic acceleration](#) [numerical simulation](#)

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