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## 格林函数法求解含移动介质轴向导热的稳态温度场
## Solving steady-state temperature fields with axial conduction in moving media using Green's function method

作者　　　　　　单位
赵国昌　　　　　沈阳航空航天大学 航空航天工程学部（院），沈阳 110136
杜霞　　　　　　沈阳航空航天大学 航空航天工程学部（院），沈阳 110136
宋丽萍　　　　　沈阳航空航天大学 高等教育研究所，沈阳 110136
李静　　　　　　沈阳航空航天大学 航空航天工程学部（院），沈阳 110136

中文摘要：

　　用格林函数法求解了考虑移动介质轴向导热影响的稳态温度场，推导了第1类和第2类非齐次边界条件下求解稳态温度场的数学表达式，利用特征值和特征函数获得了格林函数解，证实格林函数法可以解决非齐次边界条件下的稳态传热问题. 以平行板间和圆管内均匀速度移动介质的稳态传热为例，获得了在半无限长壁面和在有限长壁面有均匀热流密度两种情况下所对应的温度场的无量纲解析解，分析了移动介质轴向导热与$Pe$和$x/H$之间的关系. 结果表明：在所分析的两种热流密度边界条件下，$Pe$越大无量纲温度越小；在半无限大区域有均匀热流密度条件下，无壁面热流密度区域温度变化越剧烈，有均匀壁面热流密度的区域无量纲温度随$x/H$的变化几乎不受$Pe$大小的影响；在有限区域有均匀热流密度条件下，与半无限大区域均匀加热的情况有显著差异，在全计算域内温度变化越剧烈.

英文摘要：

　　The Green's function method for solving axial conduction effects of moving media on its steady-state temperature field was introduced. The mathematical expression describing steady-state temperature fields under first and second classes of non-homogeneous boundary conditions was derived using eigenvalues and eigenvalue functions to obtain the Green's function solutions. It was confirmed that the steady-state heat transfer problems can be solved under the non-homogeneous boundary conditions by employing Green's function method. The heat transfer of the moving media between two parallel plates and within a circular tube was calculated under uniform heat flux conditions for semi-infinite and finite lengths and the analytical dimensionless temperature solutions were obtained. The relationship between the axial conduction effects of moving media and the $Pe$ and $x/H$ was also analyzed. The results show that: the larger $Pe$ means the smaller dimensionless temperature for both cases of uniform heat flux conditions of semi-infinite and limited lengths; more intense temperature changes in the absence of surface heat flux and more mild temperature changes for the case of uniform wall heat flux of semi-infinite length are observed; in the case of limited length under uniform heat flux condition, significant differences compared with the case of uniform heating in semi-infinite region and more dramatic temperature changes in the whole computational domain are observed.

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