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涡轮叶片冷却有效性分析

丁阳, 常海萍

南京航空航天大学 能源与动力学院, 江苏 南京 210016

Analysis of Turbine Blade Cooling Effectiveness

DING Yang, CHANG Haiping

College of Energy and Power Engineering, Nanjing University of Aeronautics and Astronautics, Nanjing 210016, China

摘要

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摘要

为了获得内部换热效率和气膜冷却效率对综合冷却效率的影响规律,建立了简化物理模型对涡轮叶片复合冷却有效性进行分析,得到了内部换热效率与气膜冷却效率对综合冷却效率的影响规律:较低热负荷状态下,内部换热效率提高,综合冷却效率随之提高,内部换热效率对综合冷却效率影响大;较高热负荷状态下,气膜冷却效率对综合冷却效率影响增大,内部换热效率的影响减弱;过高的热负荷会出现综合冷却效率随着内部换热效率的增加而下降的情况,导致内部冷却失效。

关键词: 涡轮 冷却 综合冷却效率 相对热负荷 换热效率 气膜冷却效率

Abstract:

In order to figure out how internal heat exchange efficiency and film cooling effectiveness influence the overall cooling effectiveness, a simplified physical model has been built to analyze factors that influence turbine blade overall cooling effectiveness. Several conclusions are drawn as follows. Under low relative heat load, the overall cooling effectiveness rises as the internal heat exchange efficiency improves, which indicates that the internal heat exchange efficiency has a strong positive effect on the overall cooling effectiveness. Under high relative heat load, film cooling effectiveness has a stronger effect on overall cooling effectiveness, while the influence of internal heat exchange efficiency decreases. As internal heat exchange efficiency increases, excessive heat load makes overall cooling effectiveness decrease, which leads to the failure of internal cooling.

Keywords: turbine cooling overall cooling effectiveness relative heat load heat exchange efficiency film cooling effectiveness

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Corresponding Authors: 常海萍, Tel.: 025-84892201-2312, E-mail: chppe@nuaa.edu.cn Email: chppe@nuaa.edu.cn

About author: 丁阳, 男, 博士研究生。主要研究方向: 航空发动机传热。Tel: 025-84892201-2608, E-mail: dy02jx006@163.com; 常海萍, 女, 教授, 博士生导师。主要研究方向: 航空发动机传热。Tel: 025-84892201-2312, E-mail: chppe@nuaa.edu.cn

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