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圆直管中离散孔超声速气膜冷却实验

Experiment on discrete holes supersonic gas film cooling in cylindrical pipe

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中文关键词： 超声速气膜冷却 冷却效率 离散孔 吹风比 马赫数

英文关键词:supersonic gas film cooling cooling effectiveness discrete holes blowing ratio Mach number

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中文摘要:

以圆直管中的超声速高温燃气为主流,以常温氮气为气膜介质,用实验的方法研究了离散孔超声速气膜冷却规律,主流马赫数为2,射流马赫数分别为1,2,3.结果表明:射流流量是影响离散孔气膜冷却效果的最主要因素,提高吹风比或者增大孔径,都能显著提高气膜冷却效率;在实验工况下,冷却效率与吹风比和孔径的关系可以总结成实验关联式;射流喉部直径相同、流量相同情况下,射流马赫数对气膜冷却效果影响不大;在气膜孔附近,入射角为30°的射流比切向入射时的冷却效果差,在下流远离气膜孔位置,入射角为30°的射流冷却效果优于切向入射时.

英文摘要:

Experiments were made by using supersonic,high temperature gas in a cylindrical pipe as the mainstream and nitrogen at normal temperature as the injection medium to determine the rules of discrete holes supersonic gas film cooling.Mainstream Mach number was 2,and injection Mach number varied from 1 to 3 . Results show that the mass flow of the injection is the most important influential factor.Film cooling effectiveness that could be fitted into a correlation equation is enhanced greatly along with the increase of blowing ratio or diameter of the injection hole,and the Mach number of the injection has little effect on it.Injection with angle 30 degree shows better effectiveness than the tangential injection at downstream distance far from the hole, but worse effectiveness dose by the hole.

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