零攻角小钝头钝锥高超音速绕流边界层的稳定性分析和转捩预报

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摘要：研究了零攻角小钝头圆锥高超音速边界层的稳定性及转捩预测问题．小钝头的球头半径为0.5 mm，锥的半锥角为5°，来流马赫数为6．采用直接数值模拟方法得到了钝锥的基本流场，利用线性稳定性理论分析了等温壁面和绝热壁面条件下的第一、第二模态不稳定波，并用"e- N "方法对转捩位置进行了预测．在没有实验给出N值的情况下，暂取N为10．研究发现，壁面温度条件对于转捩位置有较大影响．绝热边界层的转捩位置比等温边界层的靠后．且尽管高马赫数下第二模态波的最大增长率远大于第一模态波的最大增长率，但绝热边界层的转捩位置是由第一模态不稳定波决定的．研究方法应能推广到有攻角的三维边界层流动的转捩预测．

关键词：高超音速；边界层；转捩；钝锥
中图分类号：O357.41

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