

环形激波绕射, 反射和聚焦的数值模拟研究

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收稿日期 修回日期 网络版发布日期 接受日期

摘要 应用频散可控耗散格式对环形激波在圆柱形激波管内绕射、反射和聚焦的问题进行了数值模拟研究。研究表明环形激波形成强烈聚焦的关键因素是环形激波在圆柱形管道中向对称轴运动时, 绕射激波就不断加速而不作通常情况下的衰减; 不同马赫数的环形激波绕射也产生不同马赫数及形状的准柱形激波, 导致聚焦效果和位置的差异; 另外, 环形激波聚焦于一个点而圆柱形激波聚焦于一条线, 两者有本质不同。

关键词 [激波聚焦, 绕射, 数值模拟](#)

分类号

NUMERICAL INVESTIGATION OF DIFFRACTION, FOCUSING AND REFLECTION OF TOROIDAL SHOCK WAVES

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Abstract

An investigation of toroidal shock wave motion in a cylindrical shock tube is described in this paper. Numerical simulations were carried out by using dispersion controlled dissipation scheme (DCD scheme) and validated with experimental data. From the numerical results, the toroidal shock wave diffraction, focusing and reflection were discussed in detail. It was found out that the key factor of cylindrical shock focusing is the shock acceleration when diffracting shock waves propagate toward the axis of symmetry. Mach numbers of incident toroidal shock waves play an important role in shock wave diffraction and focusing. The toroidal shock waves focus at certain point on the axis of symmetry while usual cylindrical shock waves focus on the entire the axis of symmetry, therefore, the focusing effect resulting from the two cases of focusing points are different essentially.

Key words [shock wave focusing](#) [diffraction](#) [numerical simulation](#)

DOI:

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