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The stability of nonequilibrium supersonic boundary layer

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The present work looks at the influence of molecular vibrational energy nonequilibrium on the instability of boundary layer. The boundary layer loses its stability at supercritical Reinolds numbers. At small Mach numbers M $<$ 2 can be unstable only Tollmien-Schlichting waves, which phase velocity in relation of mean flow is subsonic. The recent studies were shown that in the acoustically active gas the critical Reynolds number for subsonic disturbances is decreased in comparison with equilibrium media [1,2]. At large Mach numbers M $>$ 2 in addition to Tollmien-Schlichting waves we must take into account both falling and reflecting acoustic waves (Mach waves). As a result the interaction between vortical structure and acoustic waves leads to shift of critical Reinolds number in comparison to subsonic case. Here the dependence of critical Reynolds number on thin flat plane from degree of nonequilibrium for spatial supersonic disturbances is founded. It was shown that acoustical activity of media has a large destabilizing influence. The increment of this instability is raised with growth of the degree of non-equilibrium.
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