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The role of the frozen relative Mach number on the stability of boundary layers in chemical non-equilibrium[1] JILL KLENTZMAN, ERMAN ULKER, ANATOLI TUMIN, University of Arizona — The stability of boundary layers in chemical non-equilibrium is investigated in the inviscid limit. The flow of binary mixtures of oxygen and nitrogen over a flat plate is considered and a parametric study varying the edge temperature and pressure while keeping the frozen edge Mach number constant is conducted. In contract to the case of a calorically perfect gas, in which little to no effect on the stability would be expected, varying these parameters in the case of a gas in chemical non-equilibrium produces significant changes in the stability results. Both cold and adiabatic, non-catalytic walls are considered and the results compared. It is found that wall cooling leads to an increase in the maximum growth rate of the second mode instability and a shift in the second mode to higher wave numbers. The trends observed due to real gas effects reveal that the frozen relative Mach number may play a significant role similar to what has been found in perfect gas flows.

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