Multifunctional Shock Tube for Gravitational Turbulent Mixing Investigations 1. Formation the Richtmyer-Meshkov and Rayleigh-Taylor Instability

S.I. Balabin. A.V. Pavlenko, O.E Shestachenko, A.V. Dulov, O.E. Kozelkov, A.A. Tyaktev, N.G. Karlykhanov, M.S. Timakova, A.V. Belomestnyckh

Russian Federal Nuclear Center – Zababakhin All-Russia Research Institute of Technical Physics (RFNC-VNIITF), Vasiliev st., 13, Snezhinsk, Chelyabinsk Region, Russia, dep5@vniitf.ru

Development of gravitational turbulent mixing induced both by Richtmyer-Meshkov, and Rayleigh-Taylor instability depends on parameters of the nonstationary shock wave (M - Mach number, S – speedup distance). At RFNC-VNIITF, these investigations are performed on the multifunctional shock tube where the driver, that uses chemical reaction of oxygen-hydrogen mixture combustion, forms the nonstationary shock wave. Direct measurements of flow velocity in the shock tube by the laser Doppler anemometer demonstrated good agreement with ERA-code calculation results and for this reason instability parameters were determined by results of flow simulation. This work objective was to determine the range of attainable parameters for instability at the contact boundary of gases having different density (CO_2-air, CO_2-He) with the Atwood numbers: A = 0,21 and A = 0,83. Our analysis, in which the calculation-and-experimental method was used to determine instability parameters, allowed assessment of the multifunctional shock tube potentialities.