IAF MICROGRAVITY SCIENCES AND PROCESSES SYMPOSIUM (A2)
Fluid and Materials Sciences (2)

Author: Ms. Elena Mikhalchenko
Scientific Research Institute for System Analysis, Russian Academy of Sciences (RAS), Russian Federation

Dr. Valeriy Nikitin
Lomonosov Moscow State University, Russian Federation

SPACE FLIGHT SAFETY - DETONATION INHIBITION

Abstract

Accidental onset of detonation is one of the most hazardous events. The present paper develops methods of chemical control of detonation. The self-sustaining properties of detonation are largely determined by the heat release delay time, which is determined by the development time of the chain process. The partial removal of H from the chain process slows down the reaction and leads to the transition of the initially developed overcompressed detonation to the combustion mode. Reducing the activity of H can be achieved in many ways, one of which is the addition to an unsaturated hydrocarbon with the elimination of the double bond between carbon atoms. The resulting alkane radical is much less active than atomic hydrogen. Based on a mathematical model of the development of two-dimensional cellular detonation, it was shown that the addition of propene (propylene) C3H6 to a stoichiometric mixture of hydrogen with air reliably suppresses detonation caused by a powerful release of energy at concentrations of 3 and 4 volume percent, and does not suppress at concentrations of 2The investigations were supported by Russian Science Foundation (RSF project code 23-11- 00117).