Excitation of acoustic oscillations arising from combustion of coal dust in the channel of variable cross-section

Pesochin V R
Joint Institute for High Temperatures of the Russian Academy of Sciences, Izhorskaya 13 Bldg 2, Moscow 125412, Russia
vld@ihed.ras.ru

Theoretical study of excitation of acoustic oscillations arising from combustion of coal dust in the combustion chamber of a pulsed Magnetohydrodynamic generator was carried out. The combustion chamber is a cylindrical pipe of variable cross-section. The flow in the combustion chamber is considered one-dimensional. Mixing in the longitudinal direction is absent. It is considered that the particles of coal dust are monodisperse and have a spherical shape. It is believed that the combustion of the coal particles occurs in the diffusion mode. The heat capacity $C_p$ is assumed constant. The Lewis number is assumed to be equal to unity. The damping force acting on the coal particles during their motion in an acoustic wave was determined according to the Stokes law. In this paper, it is shown that acoustic oscillations decay in an expanding channel, but intensify in a narrowing ones. In the paper, formulas for calculating the frequency and the increment of acoustic oscillations are obtained.