Plasma Ion-Acoustic Resonances at Detonation of Condensed Explosives

Yu.L. Serov
Ioffe Institute of the Russian Academy of Sciences,
St.-Petersburg 194021, Russia

It is known, that propagation of shock waves to plasma in a real situation of high-speed movement is determined by resonant nonlinear ionic-sound interaction [1-5]. Thus for ionic Mach-number the basic condition of nonlinear resonant plasma dynamics which is 1< should be satisfied. This condition connects with formation of a soliton bunch and of an ionic-acoustic shock wave in heavy plasma components [3]. It is shown in the report, that limits of a detonation of solid explosives are determined by the nonlinear ion - acoustic interaction in a phase of plasma formation in gaseous products of decomposition. Schemes of formation of ion - acoustic soliton bunch are considered for some of solid nitro - compounds (trotyl, geksogen, oktogen, furoksans). It is shown, that structure of ion - acoustic interaction is realized in the form of a variation of speed of a detonation of explosives depending on structure of explosive and conditions of experiment. For example the detonation of trotyl is realized through a metastable term of atom of nitrogen

(2,38 eV) at participation of ions (D = 6,85 km/s), (D = 7,1 km/s). In some situations there can be also an ionization of atoms of nitrogen and formation of a bunch due to a metastable term of carbon [(2.68 eV),]. Speed of a detonation of trotyl in this case is D = 6,9 km/s. At an explosion of the scaly and granulated types of trotyl the soliton bunch are formed due to the lowest metastable term of carbon (1,26 eV) and ions of carbon, nitrogen and oxygen (D = 4,0 - 6,0 km/s). Formation of resonant nonlinear

ranges for of some furoksans (dinitrodiazenfuroksan, geksanitrobenzol, benzotrifuroksan) is considered. Speeds of a detonation of considered furoksans are determined by the maximal phase speeds of soliton bunchs , formed by ions , , and by electrons, appearing due a metastable term of a molecule of nitric oxide N(4,7 eV). It appears, that speed limits of a detonation are caused by nonlinear electro-dynamic interaction and coincide with borders of existence of ion-acoustic soliton bunch which is formed in special resonances at a stage of plasma formation. Thus the detonation of solid explosives is a special case of propagation of shock waves in plasma formed at decomposition of explosive.

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