New azides as primary explosives initiated by laser

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Currently, the worldwide interest in azides, especially metal derivatives, is increasing due to their hazardous potential arising from their energetic and toxic properties. Moreover, all heavy metal-azides rapidly detonate, and this is the reason for using some of them as primary explosives in detonators. It is also known that the initiated azides of alkali metals rapidly decompose with the release of a large volume of gaseous nitrogen [1]. However, there is no evidence if all the heavy metal azides explode under laser initiation and what laser can be better used for this purpose.

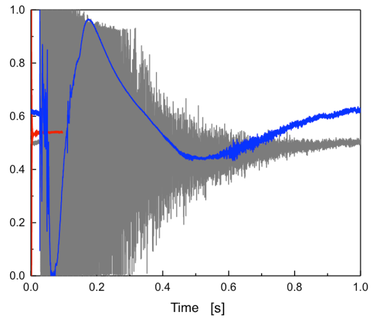

Fig. 1 Acoustic signal initiation dependence on time: without initiation (red), combustion reaction with CTAP (blue) and initiation of CTAP with AgN_3 on its surface (gray).

Currently, we investigated AgN_3, $Pb(N_3)_2$, $Cu(N_3)_2$, $Hg(N_3)_2$, $Ca(N_3)_2$, TlN_3, $Bi(N_3)_3$, $BiON_3$, $Ba(N_3)_2$, $Zn(N_3)_2$ azides and their complexes with know secondary explosives such as TNT, TNBO, HMX, RDX, etc. Some of these azides were synthesized the first time. The investigation performed by diode-pumped Nd:YAG laser Ekspla BalticSP-1064 with an output energy of ~ 9 mJ and a pulsewidth of 11 ns at a wavelength of 1064 nm. We analyzed the time-resolved spectrograms of sound waves to determine the specific properties of the azides under investigation taking into account that photoacoustic spectroscopy was successfully used for chemical detection and trace analysis (Fig.1) [2].

The results obtained indicated that AgN_3, $Pb(N_3)_2$, $Cu(N_3)_2$, $Hg(N_3)_2$, were possible to initiate with laser, while TlN_3, $Zn(N_3)_2$, $Ca(N_3)_2$, $Bi(N_3)_3$, $BiON_3$ and $Ba(N_3)_2$ were non-initiated by such way. However, the non-initiated azides and the above secondary explosives (excluding TNBO) successfully initiated by the laser when AgN_3 or $Cu(N_3)_2$ was added in these compounds. Hence, AgN_3 and $Cu(N_3)_2$ should be used as primary explosives initiated by laser.

REFERENCES

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