

Figure 11 Ballistic efficiency of PMVT + oxidizer + 13% Be compositions

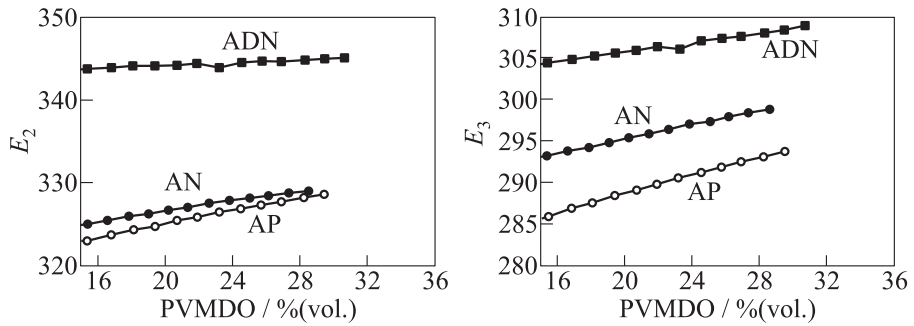


Figure 12 Ballistic efficiency of PVMDO + oxidizer + 13% Be compositions

Table 6 Calculated maximum attainable E_2 and E_3 for the compositions with AB, oxidizer, and energetic component: Al (not exceeding 20%), or Be (not exceeding 14%), or AlH_3 (not exceeding 25%)

Energetic component	Oxidizer	E_2	E_3
		g, cm ³ , s	
Al	AN	312	278
	AP	321	286
	ADN	332	294
Be	AN	329	297
	AP	331	299
	ADN	334	308
AlH_3	AN	322	294
	AP	333	300
	ADN	338	306

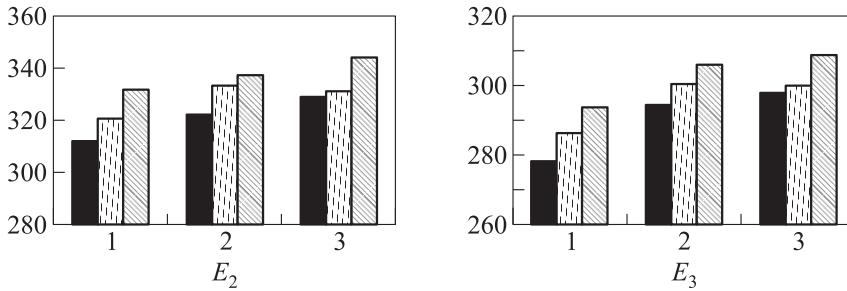


Figure 13 The calculated maximum attainable E_2 and E_3 . 1 — formulations with Al; + — formulations with AlH_3 ; 3 formulations with Be. In each group the left bar corresponds to AN, the middle — to AP, and the right — to ADN

Table 7 Energy potential of compositions containing 18% AB, 20% Al, 50% HMX, and 12% oxidizer

Oxidizer	I_{sp} , s	ρ , g/cm ³	T_c , K	E_1	E_2 g, cm ³ , s	E_3
AP	259.6	1.924	3790	384.4	337.3	295.9
ADN	261.9	1.905	3780	385.5	338.9	297.9
AN	262.3	1.895	3760	384.9	338.7	298.1

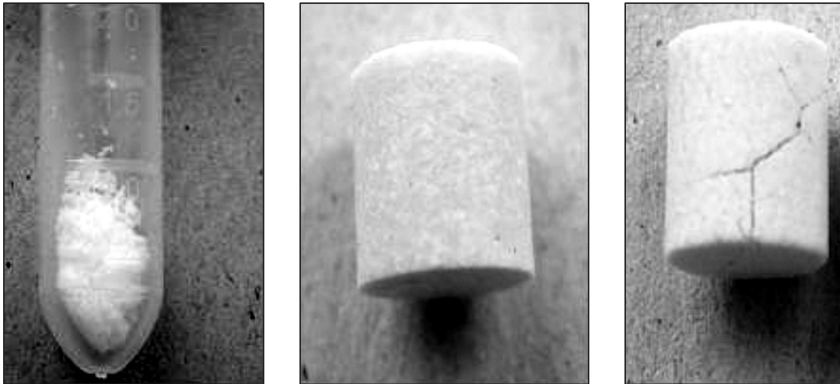


Figure 14 Samples of pressed AN tablets after multiple cyclic shock heating from -40 to $+90$ °C. Left to right: neat AN after two cycles; AN stabilized with uric acid after 10 cycles; and the latter after 40 cycles. Initial dimensions of the tablets: height ~ 8 – 10 mm, diameter 6.0 mm

sweep in small samples. The tests were aimed at application of stabilized AN in gas-generating compositions for airbag inflators. The temperature storage conditions for SCPs are substantially milder. Additionally, the remaining IV–II phase transition occurs at ~ 50 rather than at the $32\text{ }^{\circ}\text{C}$ IV-to-III phase transition often found for AN samples. Therefore, the gap between average storage temperature and phase transition has been substantially increased. The number of cases when the temperature could reach the phase transition point during years of storage has been reduced by orders of magnitude. Still, despite this optimistic assessment, a search for further phase stabilization of AN is necessary to get rid of any transition within the range of -40 to $+70\text{ }^{\circ}\text{C}$. The work is underway at the Institute for Problems of Chemical Physics of the Russian Academy of Sciences.

5 CONCLUDING REMARKS

1. Despite the fact that AN is less energetic oxidizer compared to AP and ADN, it may compete them in cases when cost plays an important role, when environmental impact of combustion products is limiting (advantage over AP) and when storage in a wider temperature range is required (advantage over ADN).
2. Upon addition of energetic components (Al, Be, hydrides), the ballistic efficiency of AN-based formulations increases more rapidly than for compositions using other oxidizers.

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