Effects of binder on molding properties of HATO-based explosives

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1.Abstract

The safety performance of HATO explosives coated by Fluororubber and energetic thermoplastic elastomer ETPE were discussed, and it was analyzed that the influence of pressure and temperature on the moldability of HATO-based explosives with different binders. The results showed: the mechanical sensitivity of HATO explosives coated by binder were low, which improved the safety of HATO explosives to a certain extent; Pressure and temperature have a greater impact on the moldability of HATO-based mixed explosives containing Fluororubber or ETPE binder, and the moldability of HATO-based mixed explosives containing ETPE binder is better, which relative density can reach more than 98% at room temperature.

2.Experiment

2.1 Preparation of explosives

Sample preparation was used by the "direct method" process. HATO-based explosive formulations with different binders (Fluororubber, ETPE) were designed, and the formula mass ratio was: HATO / binder = 95/5.

2.2 Determination of the Forming

The HATO explosive powder containing different binders was filled into a mold (Φ20mm), and the 63T precision press pressed it into a certain size of pellets under different pressures or different temperature conditions, and 3 pellets were pressed under each condition. The average relative molding density of the three pellets was taken as the molding density of the pellets under this condition.

3. Results and discussion

3.1 Research on the mechanical sensitivitye

Table 1 Mechanical sensitivity data of HATO explosives with different binders

number	Sample composition	the Impact sensitivity, %	the Friction sensitivity, %
1	HATO	38	40
2	HATO / Fluororubber	28	24
3	HATO / ETPE	32	30

3.2 Research on the formability

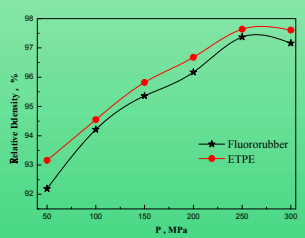

Figure 1 Effect of pressure on relative density of HATO-based explosives with different binders

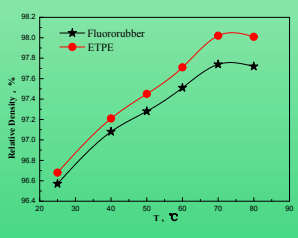

Figure 3 Effect of temperature on relative density of HATO-based explosives with different binders

Table 2 The fitting equation of pressure on relative density of HATO-based explosives with different binders

Sample composition	The fitting equation	R^2	Note
HATO+ETPE	y=2.667 Ln(x)+82.55	R^2=0.9820	Where: Y is the relative density;x is forming pressure;R is the correlation coefficient
HATO+ Fluorinerubber	y=2.629 Ln(x)+82.02	R^2=0.9830	

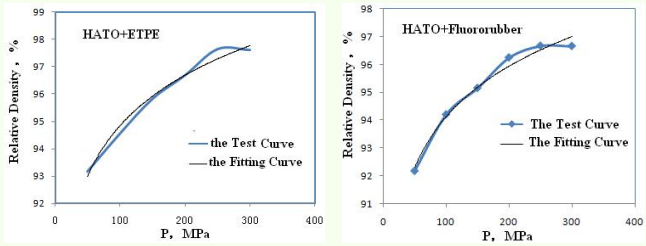

Figure 2 The Fitting curves of pressure on relative density of HATO-based explosives with different binderss

Table 3 The fitting equation of temperature on relative density of HATO-based explosives with different binders

Sample composition	The fitting equation	R^2	Note
HATO+ETPE	y=1.21 Ln(x)+92.76	R^2=0.9850	Where: Y is the relative density;x is temperature;R is the correlation coefficient
HATO+ Fluorinerubber	y=1.045 Ln(x)+93.21	R^2=0.9860	

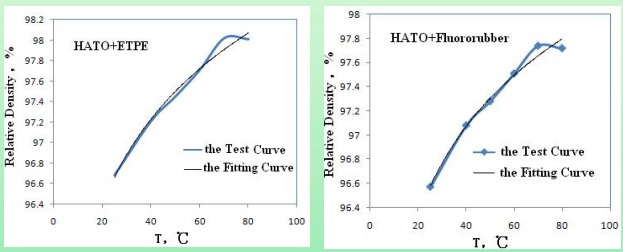

Figure 4 The Fitting curves of temperature on relative density of HATO-based explosives with different binders

4. Conclusions

(1) after azide-based adhesive (ETPE) or Fluororubber adhesive coated HATO explosive, The safety of mixed explosives samples was studied. From the mechanical sensitivity data, it is known that the mechanical sensitivity of mixed explosives is reduced, which improves the safety of HATO explosives to a certain extent.

(2) It is analyzed the influence of pressure and temperature on the moldability of HATO-based explosives containing ETPE or Fluorinerubber binder, different pressures and temperatures have a greater impact on the formability of mixed explosives. HATO-based explosives containing ETPE binders have better formability, and relative density is more than 98%. Therefore, it is possible to design explosive formulas that meet specific requirements by adjusting the pressing pressure and temperature.