

Design of Viton/PVA Binder Emulsion and its Application in Explosives Ink

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Abstract: To further improve the forming effect of suspended explosive ink, a kind of “O/W” type binder emulsion was designed by using ethyl acetate solution of type 26 fluoroelastomer (Viton) as oil phase, aqueous solution of polyvinyl alcohol (PVA) as water phase, Tween-80 and sodium dodecyl sulfate (SDS) as surfactants. The orthogonal design of $L_{25}(5^6)$ was designed by SPSS data analysis software. The content of each component and preparation process in emulsion were optimized. The analyzed and optimized results were verified by experiments, and the stability of emulsion was evaluated by the static stability of emulsion as index. The microstructure of emulsion was measured by optical microscope. The suspended explosive ink was prepared using emulsion as binder system, hexanitrohexaazaisowurtzitan (CL-20) as the body explosive. The direct writing pattern and crystal type of the explosive ink were analyzed. The results show that the mass ratio of Tween-80/SDS is 1:2, The mass fraction of an emulsifier (the total mass of the emulsion) is 2%, the concentration ratio of water phase to oil phase is 2:1, the stirring time is 30 min, the emulsifying temperature is 20 °C and the stirring speed is 350 rpm, are more conducive to maintaining the stability of binder emulsion. The emulsion binder system prepared by optimized experimental conditions can be stable about 360 h. The size of dispersed phase droplet in the emulsion is 20–120 μm , the distribution is uniform and there is no obvious agglomeration phenomenon. The prepared explosive ink writes smoothly without blocking the direct writing needle and the crystal type of CL-20 in explosive ink composite has no change.

Key words: explosive ink; orthogonal design; Viton/PVA binary emulsion binder system; hexanitrohexaazaisowurtzitan (CL-20) based explosive ink composite

CLC number: TJ55

Document code: A

DOI: 10.11943/CJEM2018154



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