Preparation and Characterization of Spherical Propellant by Microfluidic Technology

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Abstract: A T-shaped micro-channel device with continuous phase of aqueous solution and dispersed phase of ethyl acetate solution was used to prepare the spherical propellants based on the microfluidic technology. The effects of flow rate ratios and nitrocellulose/solvent ratios on the preparation of spherical propellants were studied, respectively. Results showed that when the nitrocellulose/solvent ratio was fixed to 50 : 2.5 and the flow rate of continuous phase was fixed to 1000 $\mu L \cdot min^{-1}$, the particle size was increased from 270 μm to 306 μm with the increase of the flow rate of dispersed phase from 30 $\mu L \cdot min^{-1}$ to 100 $\mu L \cdot min^{-1}$. When the flow rate ratio of the two phase was fixed to 1000 $\mu L \cdot min^{-1}$: 100 $\mu L \cdot min^{-1}$ and the nitrocellulose/solvent ratio of the dispersed phase was from 50 : 2.0 to 50 : 3.0, the particle size was increased from 250 μm to 350 μm. The characterization results of SEM show that the nitrocellulose spheres prepared by the microfluidic technology had regular morphology, narrow size distribution and good monodispersity.

Key words: microfluidic technology; spherical propellant; flow rate ratio; nitrocellulose/solvent ratio; monodispersity

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