

# PREPARATION OF MONODISPERSE SINGLE-CRYSTAL ZnO MICROSPHERES AND ITS APPLICATION ON TEXTILE FOR STRUCTURAL COLOR

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**Abstract:** Zinc oxide (ZnO) microspheres with high refractive index were synthesized, and used as the component of printing paste, which applied onto textiles as photonic crystal and the structural colored textiles with high brightness and color stability were generated.

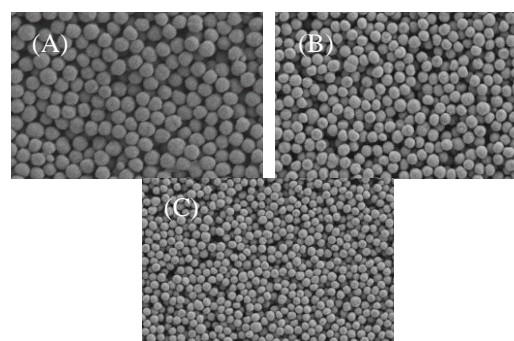
ZnO microspheres were synthesized by using the sol-gel method by two steps. Step 1: 230 g of diethylene glycol (DEG) and 4.4 g of zinc acetate dihydrate were mixed and stirred at a constant-temperature oil bath with a condensation reflux device. After the temperature of the oil bath rose from room temperature to 160 °C, the mixed solution was quickly cooled down to room temperature while maintaining stirring. And then, the emulsion-like colloidal suspension was obtained by the reaction, the suspension was then centrifuged at 8000 r/min for 30 minutes to get supernatant as Zinc oxide seed crystal for further reaction. Step 2: repeated the process of step 1 until the temperature of oil bath to 140 °C, and then added the supernatant at a rate of 1 drop per minute into the reaction system, rose the temperature of oil bath to 160 °C and kept it for 1 hour while maintaining stirring, and then cooled the solution down to room temperature. By adjusting the amount of supernatant, the microsphere emulsions with different ZnO nanosphere sizes can be prepared.

The ZnO nanospheres were obtained after centrifugation, were added it into deionized water together with PTF thickener and polybutyl acrylate adhesive, and then the printing paste was prepared.

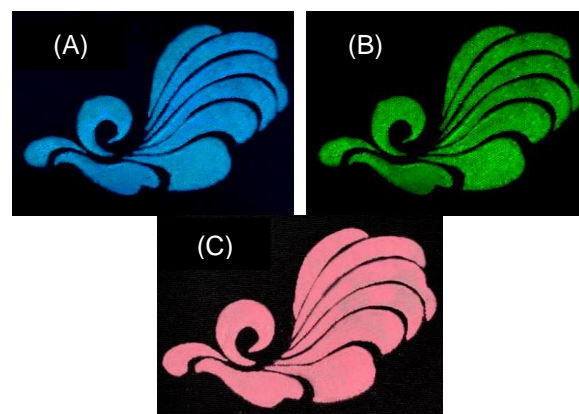
A fabric was placed under the printing screen frame, and an appropriate amount of printing paste was added onto the surface of the screen frame, the printing paste was transfer onto the surface of fabric by scrape coating, and then the fabric carrying the printing paste was placed into an electric heating thermostatic drum at a temperature of 75 °C, after drying the structural colored fabrics with photonic crystal structure were obtained.

The ZnO nanospheres with different sizes were successfully synthesized, and the SEM images are given in figure 1. The ZnO nanospheres with different sizes were also applied onto fabrics, and structural colored fabrics with different colors were demonstrated, which are given in figure 2.

**Keywords:** ZnO, photonic crystal, structural color.



**Figure 1** ZnO nanospheres with different sizes (A) 270 nm; (B) 210 nm; (C) 151 nm



**Figure 2** Structural colored textiles obtained from ZnO microspheres with different sizes (A) 151 nm; (B) 210 nm; (C) 270 nm

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