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Textile screen-printed with photochromic nanoparticles ( )

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Photochromic compounds colourize due to electromagnetic radiation reversibly. Spirooxazines are one of the most frequently used photochromic dyes due to their relatively long fatigue resistance. Photochromism can be utilized to develop smart textiles, e.g. UV sensors and protective clothes. In this work we aimed at the development of textile screen printed with photochromic nanoparticles and the improvement of resistance to photodegradation. Hence, 1,3-Dihydro-1,3,3,4,5 (or 1,3,3,5,6)-pentamethyl- spiro-[2H-indole-2,3¡[vertical-[3H]naphtha[2,1-b][1,4]oxazine] was microencapsulated by an oil-in-water emulsion, solvent evaporation method with ethyl cellulose polymer in order to increase fatigue resistance of dye. The size of forming nanoparticles, measured by dynamic light scattering, was well below 1 fYm, and it did not vary substantially in a wide dye concentration range. Co-encapsulation of Tinuvin 144 hindered amine light stabilizer in the nanoparticles did not change their size either. UV-vis measurements showed that increasing the spirooxazine concentration up to 60 % w/w did not cause dye aggregation. The nanoparticles formed were excellently suspendable in printing paste. After screen printing homogenous photochromic layer was formed on cotton substrate surface, which represented substantial colour development in CIELAB colour space measurements due to UV light even at a dye concentration of 0.045 % w/w. Doubling the concentration of photochromic dye did not increase the colour development significantly, which indicated that the maximum possible colouration was reached. Co-encapsulation of Tinuvin 144 further increased the fatigue resistance of entrapped spiroxazine, and it slightly enhanced the colouration of printed fabric