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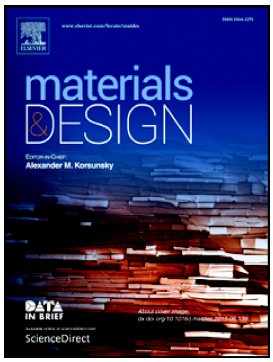

Solvatochromism based on structural color: Smart polymer composites for sensing and security

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Solvatochromism based on Structural Color: Smart Polymer Composites for Sensing and Security

Xu Dong, Pan Wu, Christian G. Schaefer, Liwu Zhang, Chris E. Finlayson, and Changchun Wang**

Dr. Xu Dong, Pan Wu, Dr. Christian G. Schaefer, and Prof. Changchun Wang
State Key Laboratory of Molecular Engineering of Polymers, Department of Macromolecular Science, and Laboratory of Advanced Materials, Fudan University, 220 Handan Road, Shanghai, 200433, China
*E-mail: ccwang@fudan.edu.cn

Dr. Chris E. Finlayson
Department of Physics, Prifysgol Aberystwyth University, Aberystwyth SY23 3BZ, Wales, U.K.
*E-mail: cef2@aber.ac.uk

Prof. Liwu Zhang
Department of Environnental Science and Engineering, Fudan University, 2205 Songhu Road Shanghai, 200438, China

Keywords: polymer composites, core-shell particles, photonic crystals, stimuli-responsiveness, structural colors

Highlights:

- Large-area transparent photonic crystal (TPC) films of polymer core-shell particles have been engineered with iso-refractive balance of indices.
- TPCs be completely and reversibly switched, between transparency and an intense structurally colored state (10% reflectance), by solvent environment stimuli.
- Cross-linking generates encrypted patterns, revealed via a solvatochromic mechanism, with applications including in sensing and anti-counterfeit security.

Abstract: We report a convenient and scalable strategy to achieve large-area transparent photonic crystal (TPC) films that can be fully reversibly switched between an initial transparent state and a structurally-colored state. This photonic material is based on an ordered colloidal crystal structure of polymer core-shell particles with an engineered refractive index balance of the core and the shell components. Highly transparent viscoelastic quasi-solid films are created that can be spatially UV-cross-linked, giving invisible encrypted photonic patterns with different solvent response compared to non-cross-linked regions, which appear after immersion in solvent media, thus demonstrating clear and fully