ELECTROPHORETIC DISPLAYS WITH TUNABLE, ANGLE-INDEPENDENT COLOR

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Electrophoretic displays (EPDs), which exploit the surface charge of microparticles to control their deposition, have become widely available in consumer electronics, such as e-readers and smartwatches. However, a full-color EPD has yet to be demonstrated and commercialized. Here, we demonstrate colloidal assemblies of engineered quasi-amorphous photonic materials, using pigmentary α-Fe2O3/SiO2 core/shell nanoparticles, exhibiting non- iridescent tunable colors which can be tuned electrophoretically. The observed colors result from combination of colloidal particle arrangements, giving rise to structural color, along with the inherent pigmentary color of the α-Fe2O3/SiO2 nanoparticles. Colloidal particle assemblies of α-Fe2O3/SiO2 core/shell nanoparticles, and therefore the resulting colors, can be manipulated by shell thickness, particle concentration and external electrical stimuli. Dynamic tunability of α-Fe2O3/SiO2 nanomaterials in the visible wavelengths is demonstrated using reversible electrophoretic deposition with a noticeable difference between transmitted and reflected colors. The distinct contrast generated can be exploited for tunable display applications.
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