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A Kind of Nano Structure Color Film and Preparation Method

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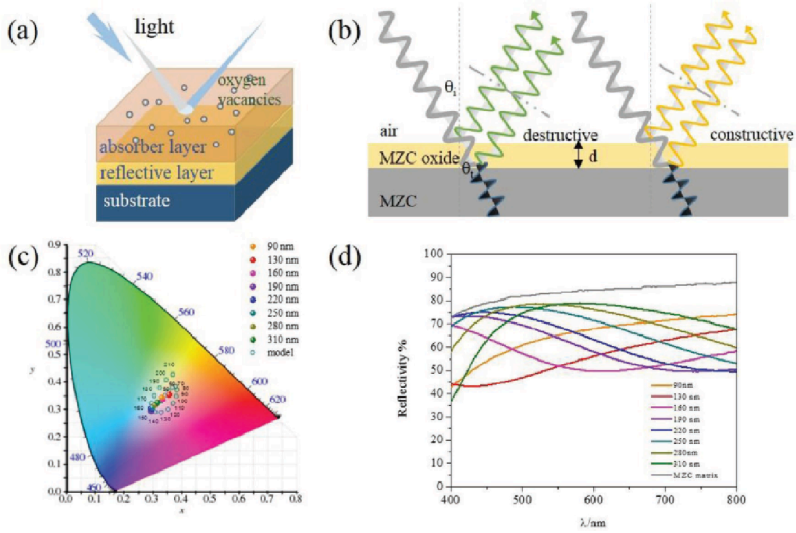

Figure 4. a) Schematic of coloration mechanism in the Mg-based color filter. b) Schematic of the interference effect in Mg-based thin films. c) CIE 1931 chromaticity diagram of samples with different thicknesses. d) Reflectivity spectra of samples with different thickness under the same oxygen flux (10 sccm).

Opportunity

Conventional reflective color filters with multiple layers of dielectric films cannot simultaneously produce a large area and good mechanical properties due to the complex multiple depositions and the difference in the thermal expansion coefficients among the material layers. Moreover, typical intrinsic color determined solely by the electronic band structure of materials in conventional colorant-pigments easily fade owing to chemical inactivation under prolonged illumination. Structure color filter based on surface plasmon resonance effect is also impractical to industrialize due to the complexity, durability and limited size. Indeed, metal-based reflective color filter is widely applicable approach to achieve various colors by utilizing optical interference effects in planar thin-film structure.

Technology

The present technology relates to the structure and its fabrication method of novel Mg-based reflective color filters which are able to generate full-spectrum colors in a large area with high hardness. The filters include an absorber layer with controllable optical constants and a reflective layer with

IP Status
Patent granted

Technology Readiness Level (TRL) 3

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an amorphous structure. The saturation and hue of the produced colors can be controlled by tuning the optical constants and the thickness of the absorber layer. Additionally, the hardness of the Mg-based reflective color filters is increased by the reflective metallic glass layers because they are derived from the same material as the absorber layer. This paradigm can pave the way for the efficient fabrication of large area color filtering devices for diverse applications, such as surface decorations, optical components, color display devices, structural color printing, and photovoltaic cells with optimum efficiency.

Advantages

- Nonfading, color tenability and high color brightness
- High strength to weight ratio, low density and excellent biocompatibility
- One-step deposition process

Applications

- Casing for communication devices/apparatus required no shielding effect under high electromagnetic frequency.
- Surface decorations or optical components in color display device
- Photovoltaic panel for optimum efficiency