

Thermoset Polymeric Cholesteric Liquid Crystal Microspheres for Application in Anticounterfeiting Features

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Streszczenie

Polymeric cholesteric liquid crystal microspheres (PCLCMs) are spherically symmetric photonic crystals that exhibit omnidirectional, angle-dependent color reflections. They are promising anticounterfeiting materials that are easy to apply in thin-film coatings and have distinct and attractive visual features. A scalable bulk suspension polymerization method was utilized to prepare highly cross-linked PCLCMs that are durable, solvent- and thermally resistant (up to 180 °C) powdered materials. SEM analysis confirmed an onion-like structure of the solid spheres, related to the cholesteric liquid crystal phase arrangement, fixed by UV-assisted polymerization. PCLCM monolayers and patterned monolayers were prepared and transferred to black adhesive tape. Reflection microphotographs presented specific textures for both the right- and left-handed circular light polarizations. Systematic studies of their angle-dependent reflection properties were conducted. Distinct color differences between diffuse light reflection and direct retroreflection colors were found. A facile method for securing authenticity was proposed based on this effect. Screen printing deposition tests of PCLCMs were performed. The produced thermoset PCLCMs have great potential to be applied in easily accessible, durable anticounterfeiting markings.

Słowa kluczowe

Light, Liquid crystals, Materials, Microspheres, Photonics, polymeric cholesteric liquid crystal microspheres, angle-dependent color reflection, colored retroreflection, thermoset, anticounterfeiting

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