
Polymerizable nanoparticles for interference layers on transparent plastic substrates

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Interference coatings for antireflective (AR) and near infrared reflection (NIR-reflex) application have been developed for plastic substrates like PMMA, polycarbonate and polyester. Coating solutions of surface modified (epoxysilane), SiO₂ and TiO₂ nanoparticles in isopropanol are synthesized leading to single layers with refractive index between 1.47 and 1.93.

Coatings are applied on flat and curved substrates (eye glass lenses) by dipcoating with different dipping angles in order to obtain optimum transmittive and reflective performance with a minimum number of interference layers. Each layer can be fixed by 1 min UV curing (1 J/cm²) before the next one is deposited. Finally, the stacks are cured at 80°C for 15 min.

Homogeneous AR systems on eye glass lenses with 2 and 3 layers and residual reflectances down to 1 % as well as NIR reflex filters with 5 layers and reflectances >72% in the range between 650 nm and 900 nm are presented. The systems obtain excellent abrasion resistance of organic-inorganic hardcoats underneath (AR) or on top of the interference layers (NIR reflex), as it is shown by taber abrasor and rubber test.

The coatings pass the salt water boiling test for more than 8 h without degradation or delamination and do not show any yellowing after UV-test with 760 W/cm² for 270 h.

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