

Large-scale fabrication of a highly stretchable and optically transparent adhesive film embedded with elastic hybrid nanoparticles

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A new strategy of the highly flexible and transparent adhesive thin film is proposed embedding elastic hybrid nanoparticles (ENs) wherein the elastic nanoparticles were chemically crosslinked to the acrylic resin. Based on facile and large-scale roll-to-roll coating and UV curing process for optical adhesive films, a hierarchical structure for the elastic hybrid nanoparticles comprising a hard silica nanocore and the reactive spring-like aliphatic shell was designed to produce transparent adhesive thin films exhibiting high elasticity. In addition, the application of a sequential dispersion method resulted in a dramatic improvement in the nanoparticle dispersibility within the resin matrix and increasing the surface grafting density of the ENs and their concentration in the film remarkably improved the elasticity of the adhesive thin films. Compared with a conventional film, the proposed adhesive film exhibited excellent relaxation and recovery characteristics as well as high optical transmittance and adhesion strength. Therefore, these new adhesive thin films will greatly benefit the flexible display industry.