

On the mechanism of phthalazine toner chemistry in controlling silver nanoparticle growth in photothermographic imaging films

A combination of normal Raman spectroscopy, surface-enhanced Raman scattering spectroscopy, and transmission electron microscopy has been used to demonstrate that phthalazine is the predominant species on the surface of metallic silver nanoparticles in the image at the final stage of development in photothermographic films. Evidence for a small amount of a cotoner, 4-methylphthalic acid, as Ag-2(4-MPA), has also been found. In addition, the organic components around the developed Ag nanoparticles have been directly observed by transmission electron microscopy using RuO₄ staining techniques. A model system, based on interaction between the toner chemicals with nanoparticulate Ag dispersions, has shown that PHZ can directly cause Ag nanoparticles to aggregate but not coalesce. Based on these results, phthalazine adsorption is proposed to play a major role, and the phthalic acid component a lesser role, in controlling metallic silver formation of the preferred metallic silver dendritic morphology.

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