Infrared Absorbing Nanoparticles for Reducing Cure Temperatures In Industrial Coatings

Infra-red (IR) absorbing materials added to plastic for reheat processing have been used in industry for years to reduce energy requirements per manufacturing unit. The additives have improved the energy efficiency of drying coatings and softening resins for molding. Similarly, it is expected that such materials can reduce required cure temperatures or bake cycles when used in thermoset coating formulations. Ovens used to cure industrial coatings consume significant energy across the country each year and thus reducing cure temperatures or bake cycles represents a significant, and previously untapped, opportunity for energy savings. Reduced energy requirements have the added benefit of reducing environmental impact through a reduction in the carbon footprint of the manufacturing process. However, conventional IR additives impact the visible light spectrum and therefore are of limited utility in applications requiring visible light transparency such as transparent coatings or pigmented coatings with exacting color specifications. For this reason, incorporating nanoparticles with the required IR absorbing characteristics is advantageous for those applications requiring coating transparency.

PPG Industries has recently identified a new nanoparticle composition, which shows an improved ability to absorb near IR while maintaining transparency compared to other compositions such as antimony tin oxide. This material also absorbs strongly over a broad range of wavelengths in the near IR which could lead to better performance at significantly reduced particle loadings. In this one-year nanomanufacturing concept definition study, the National Energy Technology Laboratory has joined with PPG Industries to explore the potential of this nanomaterial as an additive to industrial coatings. More specifically, this study seeks to reduce cure temperatures for a coating process from 400°F to 350°F through the addition of transparent IR-absorbing nanocoatings. The goals of this study are to prove the concept at the laboratory scale, and to define the critical elements that will require feasibility demonstration in subsequent stages of development.

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