Effects of nanosilica and titanium oxide on the performance of epoxy–amine nanocoatings

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ABSTRACT
Different types of composite coatings were prepared by the blending of colloidal nanosilica (SiO\textsubscript{2}) and titanium dioxide (TiO\textsubscript{2}) in epoxy resin to investigate their coating performances. A fixed amount of silica nanoparticles (20 wt \%) and different amounts (5, 10, and 15 wt \%) of microsized TiO\textsubscript{2} particles were used in the coatings. The functional groups of the formulated coatings were confirmed by Fourier transform infrared spectroscopy. These results indicate that the SiO\textsubscript{2}–TiO\textsubscript{2} particles interacted well with epoxy. Scanning electron microscopy images of the composite coatings revealed a good dispersion of TiO\textsubscript{2} particles at a lower amount of loading; this improved the adhesiveness, glass-transition temperature, thermal stability, and chemical resistance properties. At higher loadings, the performances decreased. The composite coatings were also characterized by their UV radiation-absorption properties with an ultraviolet–visible spectrophotometer. Interestingly, this property was found to be enhanced at higher loadings. An impressive result was noticed in the nanocomposites in terms of oxygen transmission rate performance compared to that of the neat epoxy.

KEYWORDS
Coating performance; Colloidal nanosilica; Oxygen transmission rates; Radiation absorption; Resistance properties; Scanning electron microscopy image; Titanium dioxides (TiO2); Visible spectrophotometers
REFERENCES


