

## Effects of nano- and micro-sized inorganic fillers on the performance of epoxy hybrid nanocoatings

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### ABSTRACT

Epoxy-based composite coatings were prepared using nanosilica (silicon dioxide ( $\text{SiO}_2$ )) and zinc oxide (ZnO). Different concentrations (5.0, 10.0 and 15.0 wt%) of micro-sized ZnO particles were used along with a fixed amount (20.0 wt%) of nanosilica particles. The functional groups of the composite coatings were confirmed by the Fourier transform infrared spectroscopy. This result indicated that  $\text{SiO}_2$ -ZnO particles were cross-linked with the epoxy. The scanning electron microscopy images of the samples revealed a good dispersion of ZnO particles. In addition, the samples showed an improved adhesive and chemical resistance properties as measured by the cross-cut tape test and chemical resistivity testing. At higher loading of ZnO, the composite coating showed poor properties. Besides that, thermogravimetric analysis, differential scanning calorimetry and ultraviolet-visible spectrophotometer were used to characterize the composite coatings. The properties were enhanced at higher loading of ZnO particles. The oxygen transmission rate was also impressive compare with the neat epoxy.

### KEYWORDS:

Nanocomposite coating,  $\text{SiO}_2$  nanoparticles, zinc oxide, UV-Vis, morphology, chemical resistance