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# Correlating Morphology and Mechanical Properties of Vinyl Ester Resin/Montmorillonite Nanocomposites

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In this work, the effect of organically modified montmorillonite (OMT) on the morphology and mechanical properties of vinyl ester resin (VER) system was studied. The morphological characterizations including d-spacing measurement, microscopy observation and phase-height image processing were conducted on VER based nanocomposites containing various OMT contents (0-5 wt%) using small angel X-ray scattering (SAXS), transmission electron microscopy (TEM) and atomic force microscopy (AFM). The presence of the well-dispersed OMT nanoparticles with an interlayer spacing between 2.3 and 2.5 nm in the VER matrix was approved by SAXS studies for the prepared nanocomposites. Moreover, additional confirmations in support of the SAXS results were obtained by TEM and AFM analyses. Microscopy observations confirmed three distinct dispersion states namely, “fully exfoliated”, “mixed exfoliated/intercalated” and “intercalated” for various weight fractions of OMT within the VER matrix. Moreover, the mechanical characterizations were performed through the tensile, flexural and impact analysis tests to ascertain the resultant nanocomposites suitability in the actual application. In view of tensile properties, the maximum elastic modulus was obtained for the nanocomposites with intercalated morphology; however the sample with mixed exfoliated/intercalated dispersion state showed the highest tensile strength. On the contrary, the incorporation of 1 wt% of OMT into the VER system which results in a fully exfoliated morphology caused the highest improvement (102%) in the impact strength over the neat sample, as compared to the other nanocomposites. Finally, the findings through flexural experiments pointed to the increase of flexural strengths as well as the corresponding modulus upon the rise of OMT content.