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MORPHOLOGICAL, MECHANICAL AND RHEOLOGICAL STUDIES OF NANO FIBRIL REINFORCED UNSATURATED POLYESTER NANOCOMPOSITES

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Natural fiber reinforced polymer composites have raised great interests among material scientists and engineers in recent years due to the need for developing an environment friendly material, and partly replacing currently used glass for composite reinforcement. Natural fibers can be used as precursors for the preparation of micro/nano particles having wide range of properties and can be used as effective reinforcing fillers in polymer matrices like polyesters, epoxy resins, rubbers etc. The resulting composites are reported to exhibit significant improvements in their properties. In this work, isora nano fibers (INFs) are prepared from a novel natural fiber, Isora by an eco-friendly steam explosion process. The obtained nano fibers were isolated and characterized. Unsaturated polyester (UP) is reinforced with INF's at different loadings and the resultant nano composites are characterized by mechanical testing, morphological studies, and rheometry. Significant improvement in mechanical properties was attained even at the low filler loading levels. The enhancement in properties like tensile strength, flexural strength and impact strength is high for 0.5 wt % indicating a uniform dispersion and strong filler matrix interaction. This increase can be attributed to the restricted mobility of the polymer chains due to the higher contacts with the INF's. Effect of INFs on the cure kinetics and the chemo rheology of UP are studied by DSC and rheometry. It is observed that the incorporation of INFs significantly influenced the crystallization temperature confirming the fact that INFs played the role of a nucleating agent and facilitated crystallization. Isothermal and dynamic tests are also performed on the neat polyester resin and its composites. Furthermore, a TGA study of the selected systems at different isothermal temperatures is performed to evaluate the styrene consumption and related loss rate during the curing process. Experimental results revealed the presence of a delay effect of INF's on the cure of the UP resin matrix.

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