ACRYLATE–SiO$_2$ NANOCOMPOSITES: A COMPARATIVE STUDY OF UN-MODIFIED AND SURFACE MODIFIED NANOPARTICLES.

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Depending on the nature of the links and interactions existing at the hybrid interface, hybrid materials can be broadly classified in two main classes. Hybrid compounds Class I, include all systems with electrostatic forces, hydrogen bonding or van der Waals interactions and hybrid compounds Class II presents the inorganic and organic components linked through strong covalent or ionic-covalent bonds. The physical–chemical properties of nanostructured copolymer acrylates based on butyl acrylate (BA), methyl methacrylate (MMA) and acrylic acid (AA) has been investigated employing un-modified SiO$_2$ (Class I) and modified SiO$_2$ particles (Class II) using 3-(trimethoxysilyl) propyl methacrylate (MPS) as compatibilizing agent. The synthesis was carried out using seeded batch emulsion polymerization system. A metastable nanostructured emulsions containing 1 wt% nanoparticles were obtained. Films casted from the in-situ nanostructured latex exhibited excellent optical transparency suggesting good nanoparticles dispersion. However, the mechanical properties showed by SiO$_2$-MPS nanocomposite, are better than the Class I hybrid compounds. Therefore, MPS SiO$_2$ surface treatment prior to polymerization enhances the physical properties of copolymer MMA–BA–AA film. The mass loss derivative traces for the polyacrylic nanocomposites and the neat polymer obtained by thermogravimetric analysis showed that the onset temperature for thermal decomposition was shifted towards a higher temperature than the neat polyacrylic, indicating the enhancement of thermal stability of the unmodified SiO$_2$ nanocomposite. However, there is a decrease of 40°C in the decomposition temperature for the modified polyacrylic nanocomposite. The results obtained so far have shown that weak van der Waals and H-bonding interactions may be sufficient to enable improvement of the physical properties of the acrylate nanocomposites.

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**References:**


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