UV radiation and change in properties of polymer composites

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Composites are used not only for their structural properties, but also for electrical, thermal, tribological, and environmental applications. Modern composite materials are usually optimized to achieve a particular balance of properties for a given range of applications. Composites typically have a fibre or particle phase that is stiffer and stronger than the continuous matrix phase. Many types of reinforcements have good thermal and electrical conductivity, a coefficient of thermal expansion that is less than the matrix, and or good wear resistance. The first level of classification of composites is usually made with respect to the matrix constituent. The major composite classes include organic-matrix composites (OMCs), metal-matrix composites (MMCs), and ceramic-matrix composite (CMCs). The term organic-matrix composite is generally assumed to include two classes of composites: polymer-matrix composites (PMCs) and carbon-matrix composites.

Rheology and its experiments reveal information about the flow behaviour of liquids but also the deformation behaviour of solids, because it is the typical behaviour of polymers. Changes induced by the environment with degradation effect can be evaluated by rheological measurements which monitor changes in visco-elastic properties of the tested polymers. The fundamental of rheological characteristics is viscosity which defines the internal resistance of material against its creep generated by external forces. It is necessary to realize the dual character of majority of polymer materials from visco-elastic point of view. The action of external force on the ideal viscous material results in its deformation i.e. irreversible locomotion (movement) of macromolecules and after removal of the external force material retains its "new" shape. The action of external force on the ideal elastic material results in its deformation but after the removal of the external force, the material returns to its original shape. Polymers are generally characterized by the visco-elastic nature, which means that external forces cause partly permanent (viscosity element of polymer) and partly reversible (elastic element of polymer) deformation

The present article deals with monitoring the changes in the mechanical properties of composites with polymer matrix. The composite was formed from the PA matrix and glass fibers. The composite contains 10, 20 and 30 % (vol.) glass fibers. The mechanical properties were evaluated on samples of the composite before and after UV radiation on the sample. Light microscopy was evaluated distribution of glass fibers in the polymer matrix and the presence of cracks caused by UV radiation. By the rheological measurements the changes of visco-elastic properties (complex viscosity, moduli of elasticity and plasticity) were carried out after different times of exposition in UV box.

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