

Flame-Retardant Polyolefin Composites with Improved Mechanical Properties – a New Way of Materials Design Involving Environment-Friendly Additives

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The potentials of Polymer-Clay Nanocomposites cause a variety of research works and developments in the field of thermoplastics including polyolefin based nanocomposites. The improvements of mechanical properties in connection with flame-retardant properties seem one for the hopeful fields for polyolefin-clay nanocomposites. Unfortunately, the incorporation of clay in polyolefins reduces only the peak of heat release and the dripping of burning parts. Nevertheless, the composites burn quite easily.

A new way for combination of fire retardant properties and improvement of mechanical properties will be shown. The release of water vapour in combination with char building is one of the most environmental friendly fire retardant mechanism.

Some metal hydroxides and also layered double hydroxides can be used as flame-retardants. They are able to form platelet structures up to nano scale. This gives the potential for connecting flame retardancy with reinforcing of the polymer. The synthesis of such materials will be shown and the materials will be evaluated by different analytical methods (e.g. TGA, FTIR).

The surface-treated metal hydroxides and also layered double hydroxides were incorporated in polyethylene matrix using compatibilizer in some cases. The dispersion of the flame-retardants under different conditions were evaluated by scanning electron micrographs and compared with measurements of mechanical properties.

The flame retardant properties were illustrated by the results of practical-situation-related test measurements, such as limiting oxygen index (LOI) and flame chamber tests (UL 94).

Conclusion for future investigations will be made.