Photostabilization of poly(vinyl chloride) – Still on the run

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Over the past decades the production and consumption of polymeric materials has been increasing rapidly. Many of these polymers are used for outdoor applications, for example in automobilers, greenhouses, and fibers for ropes. Over the past years the list of demands for these applications have grown. To meet these requirements, new polymers can be developed, or the current polymers can be modified to improve their properties. One of the disadvantage of using polymers, is that they degrade when they are used in high temperature conditions or in outdoor applications. When polymers are used in outdoor applications, the environment negatively influences the service life. This process is called weathering.

The weathering of polymers can be defined as an irreversible chemical process induced by environmental parameters that leads to undesired changes of properties of the polymers, such as discoloration and loss of mechanical properties.

Poly(vinyl chloride) (PVC) is undoubtedly among the most frequently used plastics; it is widely applied in many branches of industry and building. When exposed to natural weathering, PVC deteriorates and becomes increasingly colored and brittle, with a steady decrease in mechanical properties such as tensile, elasticity, and impact resistance. Owing to its large outdoor application, PVC has to be protected against photodegradation. To prevent photodegradation reactions, there are several ways to stabilize the polymers. One can stabilize polymers by keeping the light out, quench excited states before photochemistry occurs, or trap free radicals. This can be achieved by adding UV absorbers, quenchers, radical scavengers, metal deactivators or synergistic combinations to the polymers.