Additives are essential components of plastic formulations providing maintenance and/or modification of properties, long-term use and performance. The extension of polymer properties by additives, e.g. light stabilizers for outdoor use, has been playing a vital role in the growth of plastics. In the past additives were mainly used as materials to maintain polymer properties and to help plastics to survive heat treatment during transformation processes (heat stabilizers, antioxidants, processing aids, lubricants), to extend their service life (light stabilizers, biocides), to provide protection (flame retardants) or to modify mechanical and physical properties (fillers, glass fibers, impact modifiers, antistats). These well established additives cover the requirements of standard plastics and today’s mass applications. However, even "classical" plastic additives have been an area of continuous innovation when the market has requested products with decisively improved performance or favorable cost/performance, products with less environmental concerns or solutions for new plastic materials. Some recently introduced additives may illustrate these developments:

Selected hindered amines (HALS), more specifically NOR-HALS compounds, provide light stabilizer solutions with pesticide resistance for greenhouse applications, extended light stability of pigmented automotive parts and of PVC construction applications. Modern stabilizer packages protect not only the polymer during processing but improve productivity by shortening the cycle time e.g. in rotomolding applications. NOR-HALS chemistry is as well the basis of new halogen free flame retardants for polyolefins, efficient and multifunctional at very low loadings, imparting fire resistance, light and thermal stability at the same time.

Nanocomposites based on organically modified layered silicates represent a new family of plastic materials of substantial scientific interest and of emerging industrial practice. Despite proven benefits of nanocomposites such as mechanical properties, barrier properties and contribution to fire retardancy, polymer nanocomposites are used today only in niche applications. Potential reasons of the limited growth of nanocomposites are due to processing and dispersion challenges and inferior oxidative and photooxidative stability compared to standard plastics. To moderate the negative influence of fillers on the (photo)oxidative stability blocking of the active sites on the filler by so-called filler deactivators or coupling agents is a potential solution. Therefore, stabilizer systems comprising phenolic antioxidants, phosphites and filler deactivators extend the life-time of polyolefin nanocomposites to values as known from unfilled polymers. Through adjustment of the stabilizer composition by adding selected UV-Absorbers and hindered amines and of the loading it is possible to achieve protection of the polymer nanocomposite against photooxidation to an extent as needed for an outside application.

What will be the future for plastic additives?

With the current trend towards producing plastics in ever increasing volumes and fewer individual grades, the importance of additives for generating and shaping new applications and effects will continue to increase. The decisive area of innovation for additives will be the extension of polymer properties and the development of commercially competitive, extended and new functions that were previously not accessible or were confined to the polymer itself. A few examples will illustrate this hypothesis: Surface modifiers can alter the hydrophilic or hydrophobic character of a polymer and increase the scratch resistance of e.g. automotive parts. New clarifying agents are efficient in polypropylene applications at extremely low loadings. Smart additives, incorporated in polymer films, introduce new functionalities and effects whereas e.g. packaged goods are protected or the growth of plants in greenhouses is promoted. The contribution shows the role and the value of additives used in plastics with focus on recent developments and future trends.