

Editorial corner – a personal view

Increasing service lifetime of commodity polymers in parallel with development of usable biodegradable polymers

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In my previous two ‘Editorial corner’ contributions, I discussed the question of whether biodegradable polymers are the solution to the world’s plastics waste problem and whether it would be better to also investigate ways to increase the lifetime of petro-based commodity polymers in order to reduce plastic waste until we have biodegradable polymers with (almost) identical properties to the petro-based polymers currently in use. As an example, I mentioned polyethylenes that are used above ground for irrigation, especially in Middle Eastern countries.

In our group’s recent research we focused on two kinds of low-density polyethylene (LDPE) and one linear low-density polyethylene (LLDPE), all manufactured by a petrochemical company in Qatar, in collaboration with groups in Greece and Germany. Our aim was to combine ‘green’ UV/heat stabilising and fire retardant additives and to investigate the influence of different additives and their combinations on the flammability, as well as thermal and mechanical properties, of the various polyethylenes. We also looked for possible synergistic and/or antagonistic interactions between the additives. The additives were incorporated into the polymers at total loadings between 30 and 35 wt.% by means of twin-screw extrusion and exposed to accelerated UV radiation and heat for periods up to 1500 h. The formulations showed excellent flame retardancy, even after prolonged artificial weathering, but a noticeable, albeit acceptable, decrease in mechanical properties was observed. All the results showed that the polyethylene compounds developed were very promising for

outdoor applications, such as irrigation piping, where long-term weathering stability is important, and where flame retardancy is a concern during storage.

Continued research on the development of longer-lasting and safe polymer formulations, in parallel with the current research efforts to develop biodegradable polymers suitable for a variety of applications, will certainly contribute to reducing the environmental threat posed by plastic products. It is, however, up to the regulating authorities to ensure that polymer formulations, such as those described above, are used and re-used until their properties are reduced to the point where they are no longer safe for continued use. It should, however, be noted that these plastics still pose an environmental threat, but less plastic waste should be disposed of if the products can be used and reused for longer period. At the same time the authorities should also establish composting sites for biodegradable polymers and ensure that unusable biodegradable polymer products are recycled and transported to these composting sites. Without this controlled intervention, all scientists’ efforts will be wasted.



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