

Plastics and Nanomaterials, new approaches for advanced properties.

Luis Roca Blay

Iroca@aimplas.es

Gustave Eiffel, 4 (València Parc Tecnològic) 46980 - PATERNA (Valencia), Spain

Carbon Nanotubes, Inorganic nanotubes, nanoclays, graphene; Nanomaterials offer a big potential for many properties: Electrical and thermal[1] conductivity, EMI[2] shielding, flame retardancy [3], antimicrobial activity, active principles release [4], or custom made materials due to nanomaterial's modification; all these properties can be applied in many fields of high added value: Security, defense or health among others.

Nanomaterials by themselves can not fulfil the expectations of their good properties; they need a support, plastics, to be integrated for further transformation in useful items, plastic parts (protective cases, helmets, sockets etc...), plastic films, fibers (sensors[5] and high performance textiles).

Melt compounding is the technique that allows incorporating these new materials within plastics and dispersion is the key point, if we are not able to disperse properly these nanomaterials it will be impossible to reach these properties in the final products.

Plastics and its processing methods such as multilayer film die cast, co-injection or bi-injection moulding allow maximizing and economizing the efectivity of nanomaterials.

Therefore a holistic point of view of the challenge could give us the solution, nanomaterial plus plastic plus adequate processing method equals to desired performance.

References

1. "Thermal conductivity of carbon nanotubes and their polymer nanocomposites: A review", Zhidong Han, Progress in Polymer Science Volume 36, Issue 7, July 2011
2. "Comparative study of electromagnetic interference shielding properties of injection molded versus compression molded multi-walled carbon nanotube/polystyrene composites", Mohammad Arjmand et al. Carbon, Volume 50, Issue 14, November 2012
3. "Nanoclay and carbon nanotubes as potential synergists of an organophosphorus flame-retardant in poly(methyl methacrylate)", Nihat Ali Isitman, Polymer Degradation and Stability, Volume 95, Issue 9, September 2010.
4. "Carbon nanotube nanoreservior for controlled release of anti-inflammatory dexamethasone" Xiliang Luo et al, *Biomaterials*, Volume 32, Issue 26, September 2011.
5. "Electromechanical performance of poly(vinylidene fluoride)/carbon nanotube composites for strain sensor applications", A. Ferreira et al, Sensors and Actuators A: Physical, Volume 178, May 2012.