Block copolymers in tomorrow's plastics

In this era of portability and rapid technological advances, polymers are more than ever under pressure to be cheap and offer tailored property profiles. Often, the key lies in designing blends and alloys carefully structured at the appropriate scale (preferably less than a micrometre) from existing polymers. Block copolymers — two or more different polymer chains linked together — have long been thought to offer the solution. Local segregation of the different polymer blocks yields molecular-scale aggregates of nanometre size. Recent progress in synthetic chemistry has unveiled unprecedented opportunities to prepare tailored block copolymers at reasonable cost. Over twenty years of intense academic research and the advent of powerful statistical theories and computational methods should help predict the equilibrium and even non-equilibrium behaviour of copolymers and their blends with other polymers. The gap between block copolymer self-assembly and affordable nanostructured plastics endowed with still-unexplored combinations of properties is getting narrower.