

SHAPE MEMORY AND MECHANO-RHEOLOGICAL PROPERTIES OF AMINE CONTAINING POLYETHYLENE/POLYCAPROLACTONE BLEND.

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ABSTRACT

Biodegradable polymers can potentially reduce global plastic waste generation.¹ Therefore, the incorporation of compostable polymers into manufacturing streams is highly desired. To date biodegradable polymers are limited in their application due to relatively poorer mechanical properties compared to those of commercial polyolefins and other commodity polymers.^{2,3} Blending biodegradable polymers with other polymers is a practical strategy for developing materials with superior mechanical properties.⁴ Herein, we report the blending of biodegradable polymers with aminated polyethylene (APE) previously developed.⁵ The intrinsic hydrogen-bonding ability of the APE⁶, coupled with the hydrogen bond accepting capability of biodegradable polyesters, is exploited to access miscible polymer blends that could also be useful for the compatibilization of otherwise immiscible commodity polymers. APE is blended with commercially available polycaprolactone (PCL) at various compositions. Films are processed by compounding and extrusion. The thermal properties of the blended materials are investigated by differential scanning calorimetry (DSC) together with rheological tests to investigate the miscibility and processability of the blends. Composition-dependent single point T_g s and lowering crystallinity levels provide the indication of formation of highly miscible blend. Tensile tests (TT) were used to probe the mechanical properties of the newly generated blended materials. APE is known to exhibit self-healing and exceptional adhesive properties.⁵ On the other hand, pure APE does not possess any shape memory properties. Surprisingly, blending it with PCL results in a polymer mixture which changes its shape upon exposure to an external stimulus and returns to its original shape by a simple heat treatment.

FIGURES

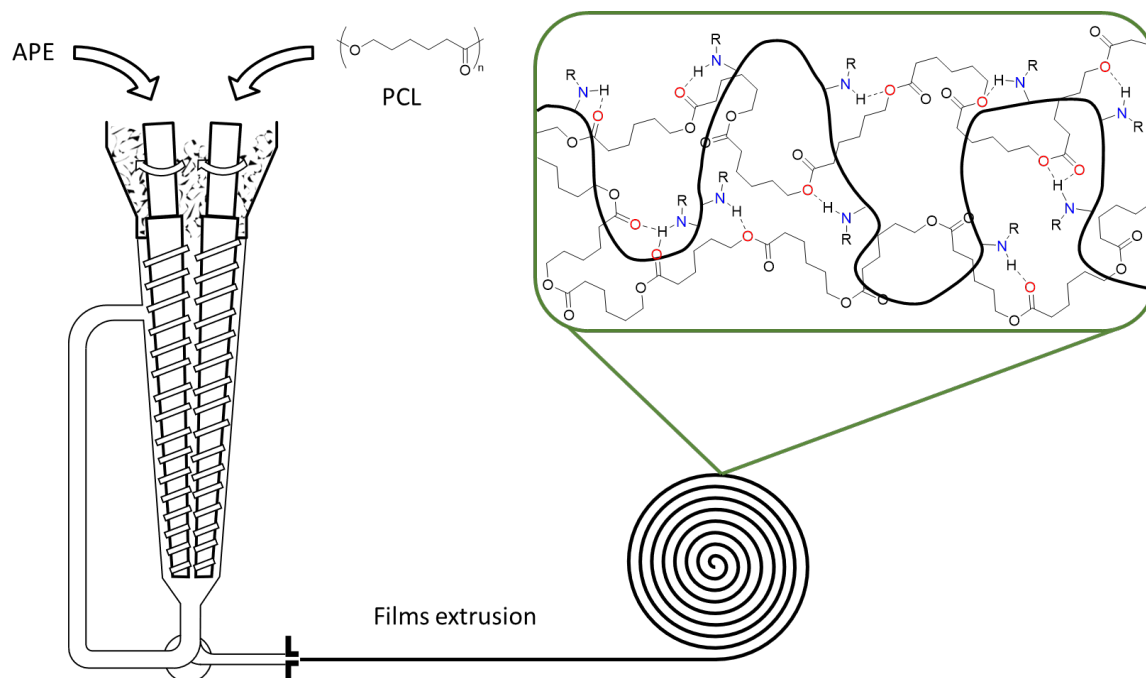


Figure 1: Graphical abstract

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