

Title: Mechanics of a high performance polymer blend

Keywords: Statistic physics, Mechanics, Semicrystalline Polymer

Scientific description: The study concerns the mechanical properties of a miscible mixture of a semi-crystalline polymer (A) and an amorphous polymer (B) whose melting and glass transition temperatures are high to allow high performance applications.

When the polymer A crystallizes, the polymer B is ejected from the areas where the crystalline lamellae are formed. It is thus redistributed within the areas that remain amorphous. A complex structure is thus created within the material. On the one hand, the amorphous domains that are inserted between the crystalline lamellae can be of variable thickness. On the other hand, their concentration of polymer B can also be heterogeneous. Previous characterizations by calorimetry and X-ray scattering made it possible to retain two hypotheses concerning the characteristic lengths of the microstructure.



Schematic representation of the expected structure. White is crystal, and red and green are respectively the two amorphous phases with different compositions in A and B

Using creep experiments, measurement of fracture properties and physical modeling, this involves understanding the relationship between micro-structure and non-linear mechanical properties. For this, measurements at different temperatures and rate of deformation will be performed and will be compared to the measured mechanical responses for each of the two polymers.

This work is part of a thesis and can be extended by another thesis. It will be realized within the framework of the DEEP chair which is a collaboration between ESPCI Paris, Mines

ParisTech and the company Hutchinson.

Techniques/methods in use: Non-linear Mechanical measurements, Computer simulation

Applicant skills: Thorough and Curious

Industrial partnership: industrial Chair Mines de Paris/ESPCI/Hutchinson)

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Internship location: ESPCI -PARIS

Possibility for a Doctoral thesis: Yes: CIFRE – to be confirmed