Post-doctoral position 12 months, may 2024

Mines Paris, Centre de Mise en Forme des Matériaux (CEMEF) Sophia *Antipolis, France*

« Influence of recycled contaminated PET resins on bottle blowing process »

Context and overview of the project: Recycling PET bottles is now an ecological, societal, and industrial issue. Food packaging tends to develop solutions that are « mono-material » solutions and PET could be one of the most promising material candidates. The « Single Use Plastics » directive approved by the European Parliament on March 2019, sets a target of collecting 90% of plastic bottles by 2029 (77% by 2025). The second step will be to incorporate, by 2025, 25% of recycled plastics in all PET bottles (and 30% in all plastic bottles by 2030). Regarding recycled PET, issued from possible degraded blends submitted to several recycling loops, new protocols must be found to optimize blowing process conditions. The objective of the present project is to better understand the impact of contamination of recycled PET (rPET) on Injection Stretch Blow Moulding (ISBM) process (Figure 1).

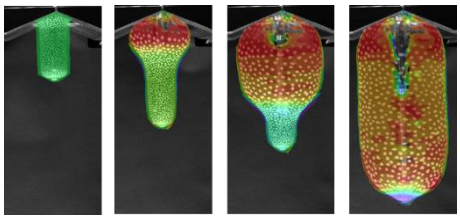

Figure 1: Strain field evolution during injection stretch blow moulding process

This postdoctoral study will be conducted in close collaboration with SIDEL Group. The experimental protocols available at both CEMEF and SIDEL will be applied to better understand the relationships between process, microstructure, and final properties. The materials for the study, recycled and contaminated PET resins, will be provided by SIDEL.

Mission: The project proposes different steps that are described below:

1) Initial state of the preform: cold crystallization and forming range

Cold crystallization kinetics and forming range analysis will be carried out on resins injected in their amorphous state. Time/temperature equivalence principle will be used to mechanically characterize preforms in the same physical state.

2) Ability of rPET to be stretched in their rubbery-like state

The objective of this step is to understand the influence of contamination on the stretchability of rPET. Uniaxial tensile tests will be performed in controlled temperatures and strain rates conditions. Additionally, the capacity of rPET to undergo significant deformation in the ISBM process will be investigated through both free and instrumented blowing experiments.

3) Induced microstructure analysis

At the laboratory scale, the microstructural organization of stretched rPET will be characterized. Various protocols involving X-ray Scattering (WAXS), infrared spectroscopy (FTIR), or dynamic mechanical analysis (DMA) will be used.

Tools: Experimental platform with DMA, DSC, DRX, uni-axial stretching device in temperature with local measurements of strain and temperature fields.

Skills and abilities requested: The recruited candidate must hold a Ph.D. in polymer materials science. The candidate should demonstrate strong skills in the mechanics and physics of polymers in the solid state. The research study, oriented towards an applied field, will require an affinity for experimental approaches. Strong experimental rigor as well as proficiency in synthesis and communication will be necessary

Duration: 12 months, as soon as possible starting from may 2024
Approximate salary: 36.5 k€
Location: CEMEF, Mines Paris, Sophia-Antipolis (06), France (https://www.cemef.minesparis.psl.eu).

Application: Applications must be sent to the supervisors below and must include: a CV, a cover letter as well as the contact of two referees to recommend the candidate.

Contacts : - CEMEF : Jean-Luc Bouvard (jean-luc.bouvard@minesparis.psl.eu)
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- SIDEL : Mikael Derrien (Mikael.Derrien@sidel.com)
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