

ANNOUNCEMENT

Chemical Engineering Seminar

When: *Wednesday January 14, 2015 at 3:30 PM*

Where: *ECE 217*

Multilayer coextrusion as a new tool to look at old polymer science problems

Guillaume Miquelard-Garnier

Arts et Métiers ParisTech, Paris, France

Though multilayer coextrusion was invented almost 40 years ago, it has mainly been used and improved over the last two decades by one group (see reference (1) for example): it consists in forcing, by successive slicing and recombining, polymer flows to create materials composed of alternating layers of different polymers (see figure 1) up to thousands of stacked layers, which has shown potential to create new materials where both phases are confined under the form of continuous nanolayers.

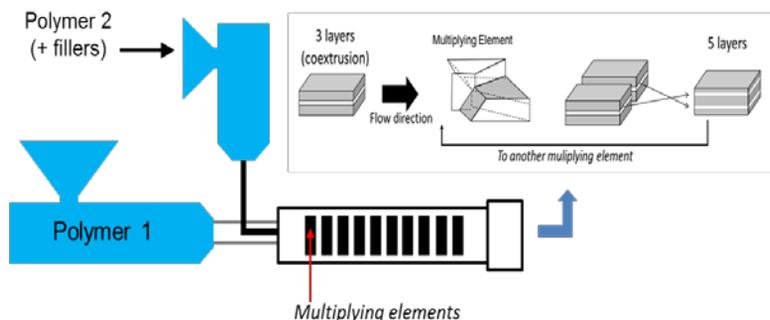


Figure 1: schematic of the multilayer coextrusion setup

We have recently developed such a setup with up to 10 multiplying elements, leading to 2049 theoretical layers in the resulting film. In this talk, I will present some of the research built in the group around this tool. First, I will discuss why, when brought down to nanometric scales, instabilities can occur during the process, and break the continuity of the layers. In particular, I will discuss which parameters (processing, physical or chemical ones) could be responsible for these instabilities. Then, I will show that this tool is promising to disperse carbon based nanofillers such as graphene or carbon nanotubes in polymer matrixes and how important reinforcements can be reached at very low filler fractions (2 and 3). Finally I will present some preliminary results on how this tool can be of interest to study the self-assembly of block copolymers under confinement.

(1) M. Ponting, A. Hiltner, E. Baer, *Macromolecular Symposia* 294, 19 (2010).

(2) G. Miquelard-Garnier, et al., *Polymer* **54**, 4290 (2013).

(3) X. Li et al., *Polymer* **55**, 248 (2014).