

A NEW INTERFACIAL SURFACE GENERATOR FOR THE CO-EXTRUSION OF MICRO- AND NANO-LAYERED POLYMERS

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Recent advances in layer-multiplying co-extrusion of incompatible polymers have made possible to fabricate multilayered nanostructures with improved barrier, thermal and mechanical behavior. However, existing layering techniques are very sensitive to mismatches in viscosity and elasticity of the co-extruded polymers which often give rise to layer non-uniformity and flow instabilities, e.g., encapsulation. In this work we present a new interfacial surface generator that markedly minimizes pressure drops and increases flow uniformity and compare its performance with the current design, both computationally and experimentally. In the former case we compare the predicted velocity profile, pressure drops and flow stability along both channels using a full viscoelastic analysis. These were then compared with experimentally measured pressure drops and with the visualization of layer stability. The good agreement between the simulations and the experiments provides a blueprint for the design of multiplying dies tailored to the specific relative rheological characteristics of the co-extruded materials, thus widening the processing window and the range of materials that can be multilayered.