

NEW NANOFIBER AND NANOLAYER SYSTEMS BY FORCED ASSEMBLY

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ABSTRACT

In recent years, numerous research advances in the Center for Layered Polymeric Systems (CLiPS), a Science and Technology Center of the U.S. National Science Foundation, have been made in many novel scientific areas. Continuous solventless coextrusion processing using multiplying dies is currently being used to create both new nanofiber and new nanolayer systems by employing only viscoelastic melts of established state-of-the-art polymeric materials.

Specific examples will be discussed that focus on the effects of scale on both the hierarchical structure and properties of these systems. The micro and nano layered examples will include – tunable reflectors which are biomimetic copies of butterfly wings; novel composite dielectric films for capacitors possessing enhanced interfacial characteristics; unique shape memory systems processed from continuous micro and nanolayered polymers that are superior to similar block copolymers and co-continuous blends; high barrier layered systems to both oxygen and water for possible use in electronic applications. Lastly, a new highly flexible process for creating unique nanofibers by a related solventless coextrusion methodology will be described with particular emphasis on filters for gaseous and liquid systems.