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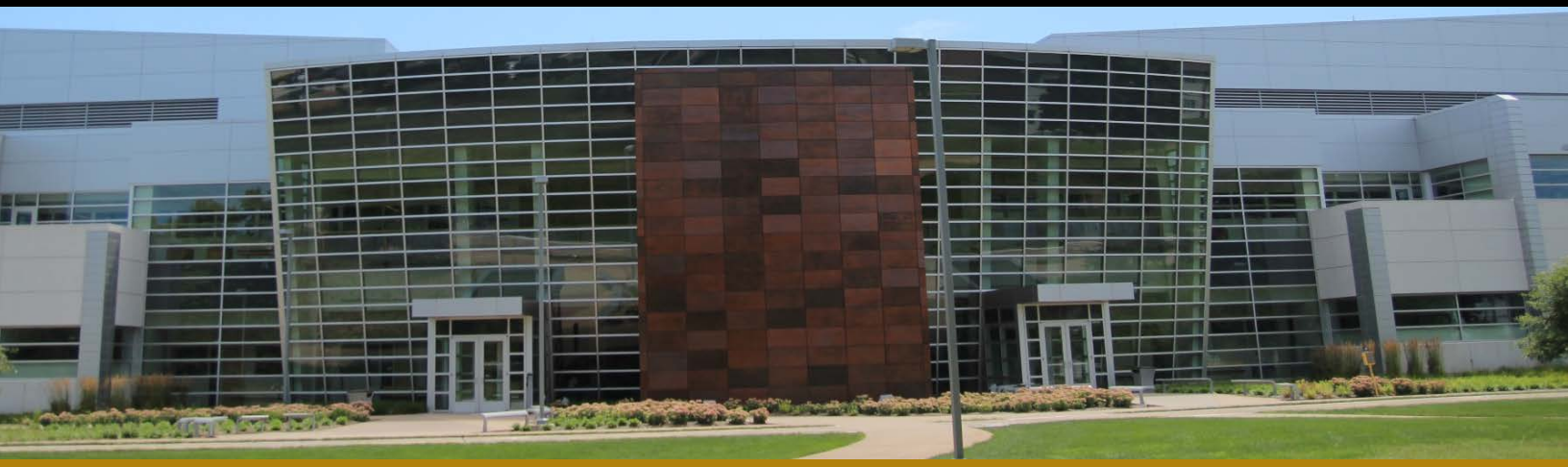

Birck Nanotechnology Center

Multi-Component Polymer Processing for Novel Applications

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Wednesday, October 10, 2018
1:30pm – 2:30pm, BRK 1001

Abstract: In the polymer processing, control of the shape of products as well as control of the high order structure in the products is crucial. In this presentation, utilization of multi-component fiber spinning for the better controllability of shape and high order structure will be discussed. Optical functionality can be introduced to the polymer products through the control of refractive index and its anisotropy. Interference colored fiber was developed by incorporating the alternating multi-layered structure of two polymers into fiber cross-section. We have tried to produce the RPF (reflective polarizing film) by embedding the aligned bicomponent fibers with controlled refractive index anisotropy in the UV cure resin. In this case, good controllability of molecular orientation of sheath and core components in the high-speed melt spinning process was utilized. Control of molecular orientation also leads to the development of fibers with unique thermal-mechanical characteristics. Highly crimped fibers were produced through the melt spinning of side-by-side bicomponent fibers consisting of virgin and recycled-modified poly(ethylene terephthalate). Mutual interaction of two components for the structure development behavior in the melt spinning process was utilized to fabricate sheath-core bicomponent fibers consisting of polyethylene and polypropylene. The fiber, which have a unique characteristics of spontaneous elongation upon annealing, is now widely applied for the production of non-woven fabrics of soft touch. All thermoplastic fiber-reinforced composites can be prepared through the compression molding of sheath-core bicomponent fibers consisting of high melting temperature core and low melting temperature sheath components. Since the compression molding of bicomponent fiber is possible if the sheath part is consisting of a crystalline polymer in an amorphous state, fiber-reinforced single-polymer composite was prepared through the compression molding of sheath-core bicomponent fibers consisting of low and high molecular weight PET.

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