UGC/FDS11/P01/21

Title of Project

Key fundamental issues about the preparation of multiple-layer Janus functionalEnglish:nanofibers through electrospinning

Chinese: 电纺制备多级Janus结构功能纳米纤维的关键基础问题研究

Abstract of Research Comprehensible to a non-specialist

The design of novel functional nanomaterials is increasingly dependent on the creation of new complex architectures and, more importantly, the understanding of structure-performance relationships at the nanoscale. Numerous novel strategies for production of functional nanomaterials, including those for biomedical applications and controlled release drug delivery have been investigated based on the complex nanostructures such as core-shell, side-by-side (often termed as Janus) and their combinations. However, how to robustly produce these complex poses a big challenge to the researchers in the fields of physics, chemistry and material engineering.

In our recent work, we successfully developed several kinds of multifluid electrospinning processes to generate complex nanostructures, allowing for tailoring the functional performances of the resultant nanofibers. We have also developed modified coaxial and modified tri-axial electrospinning to create hierarchy nanostructures from un-spinnable working fluids.

Building on this success we are proposing the preparation of new tri-layer Janus nanofibers using a new 3-fluid side-by-side electrospinning process, aiming to figure out two key fundamental issues. One is the nanofabrication mechanism of tri-layer Janus nanofibers using the tri-fluid side-by-side electrospinning process, particularly the influence of un-spinnable fluid on the formation of an integrated tri-layer Janus structure. The other is the structureperformance relationship based on the tri-layer Janus nanofibers. The knowledge gained from these two issues should benefit the developments of new multifluid electrospinning processes and provides more strategies for conceiving multiple-functional applied nanoproducts.