414b Nanofabrication of Anisotropic Biomaterials Using Electrified Jetting

Kyungho Roh, Sonsoles Olano, David C. Martin, and Joerg Lahann

In tissue, directed interactions between cells and their substrate play a critical role in many fundamental processes such as angiogenesis, inflammation, apoptosis, and wound healing. While great progress has been made over the last decade with the development of novel, more biomimetic cell substrates and scaffolds, most biomaterials used to date have been locally isotropic. The need for anisotropically designed microenvironments will fuel the development of novel nano-structured scaffold materials.

We developed a technique based on electrified jetting to fabricate polymer-based biphasic nanoparticles and nanofibers in the size range between 20 and 2000 nm. Using transmission electron microscopy, scanning electron microscopy, and scanning laser confocal microscopy, we confirmed the ability to control size, shape, and materials distribution at the micro- and nanoscale. We further demonstrated the controlled immobilization of different ligands on the different sides of biphasic nanoparticles, essentially establishing mulitvalent carriers. Anisotropic, biphasic nano-materials may have potential as scaffolds for regenerative medicine and advanced carriers for drug delivery applications.