Journal of Material Sciences & Engineering
ISSN 2169-0022
2020
Vol.9 No.5

Fabrication of topologically anisotropic microparticles and their surface modification with pH responsive polymer brush

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Abstract

The performance of particles is highly influenced by particle size, shape, surface chemistry, elasticity and permeability[1]. Electrohydrodynamic jetting technique has proven to be a versatile technique to fabricate particles with different shapes and sizes. In this work, we have fabricated topologically anisotropic cup shaped made from polylactide (PLA)/ poly[methylmethacrylate-co-2-(2-bromopropionyloxy) ethyl methacrylate] (75/25) of ~6 µm size using electrojetting technique. Solution and processing parameters were changed to understand the mechanism of cup shape formation and to control particle's shape from cups to discoids. Surface initiated atom transfer radical polymerization (ATRP) of stimuli responsive DMAEMA (2-dimethylamino ethyl methacrylate) was subsequently carried out for 1 h onto the surface of cup shaped particles to observe pH responsiveness of the modified anisotropic particles. An interesting change in the morphology of cup shaped particles was observed which changed to elongated cup and showed significant swelling under acidic pH (swelling ratio:~1.6), also enhanced dye adsorption at specific pH was observed by optical microscope and confocal laser scanning microscope implying that DMAEMA polymerization happened onto the surface of the composite microparticles. The Raman microscopy and FTIR spectra obtained from the particles after polymerization further confirmed the immobilization of pH responsive poly (DMAEMA) brushes onto the cup shaped particles which may potentially function as triggered/targeted drug delivery vehicles. Moreover, the brush modified cup shaped particles were found to be two times more efficient in adsorbing dye compared to disc shaped one indicating a clear advantage of using cup shaped particles over other shapes for immobilizing/adsorbing charged species e.g. sensitive biomolecules.

Biography:

Ifra Mirza is a research scholar at Indian Institute of Technology, Delhi. She has expertise in particle's fabrication via electrohydrodynamic jetting technique (modification of electrospinning) and surface modification.

Speaker Publications:

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21st World Congress on Materials Science and Engineering; Webinar - June 22-23, 2020.

Abstract Citation:

Ifra Mirza, Fabrication of topologically anisotropic microparticles and their surface modification with pH responsive polymer brush, Materials Congress-2020, 21st World Congress on Materials Science and Engineering; Webinar - June 22-23, 2020

(https://materialsscience.insightconferences.com/abstract/2020/fabrication-of-topologically-anisotropic-microparticles-and-their-surface-modification-with-ph-responsive-polymer-brush)