Soft Nanocomposite Materials and Their Applications in Cell Harvest Systems and Antithrombogenic Coatings

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Abstract

Novel soft nanocomposite materials, such as nanocomposite hydrogels (**NC gels**)[1] with unique organic(polymer)/inorganic(clay) network structure, transparent soft nanocomposite films (**M-NC**)[2] with unique clay-network morphology consisting of core(polymer)–shell(clay) nanospheres, new stimuli-responsive NC gels (**MD-NC gels**),[3] and amphiphilic block copolymers (**MDM**)[4] with triblock or 4-arm block architectures, have been developed.

All NC gels and M-NCs were synthesized by *in-situ* free radical polymerization in aqueous media in the presence of exfoliated clay platelets, and obtained as flexible and transparent soft materials in various forms such as thin film, rod, hollow tube, sphere, etc. Owing to these unique network structures, all NC gels and M-NCs showed extraordinary high mechanical properties such as ultrahigh elongation and widely controlled modulus and strength. In addition, the NC gels and M-NCs exhibited a number of new characteristics related to optical anisotropy, stimulus sensitivity, surface properties, self-healing, biocompatibility and cell culture.[5] In the presentation, we outline the novel features of these soft nanocomposites and demonstrate the potential as soft culture substrates with capability of thermo-responsible cell adhesion/detachment useful for a living cell harvest system.

MDM block copolymers composed of hydrophobic (poly(2-methoxyehtyl acrylate): M) and hydrophilic (poly(*N,N*-dimethylacrylamide): D) segments were prepared by RAFT polymerization through a versatile one-pot synthesis. The two opposing characteristics of high protein repellency and good substrate adhesion were achieved by the combined effects of the molecular architecture of block copolymers, the low glass transition temperature, and the low protein adsorption capability of each segment. The resulting coated surfaces showed superior protein repellency and antithrombogenicity.[6]

References

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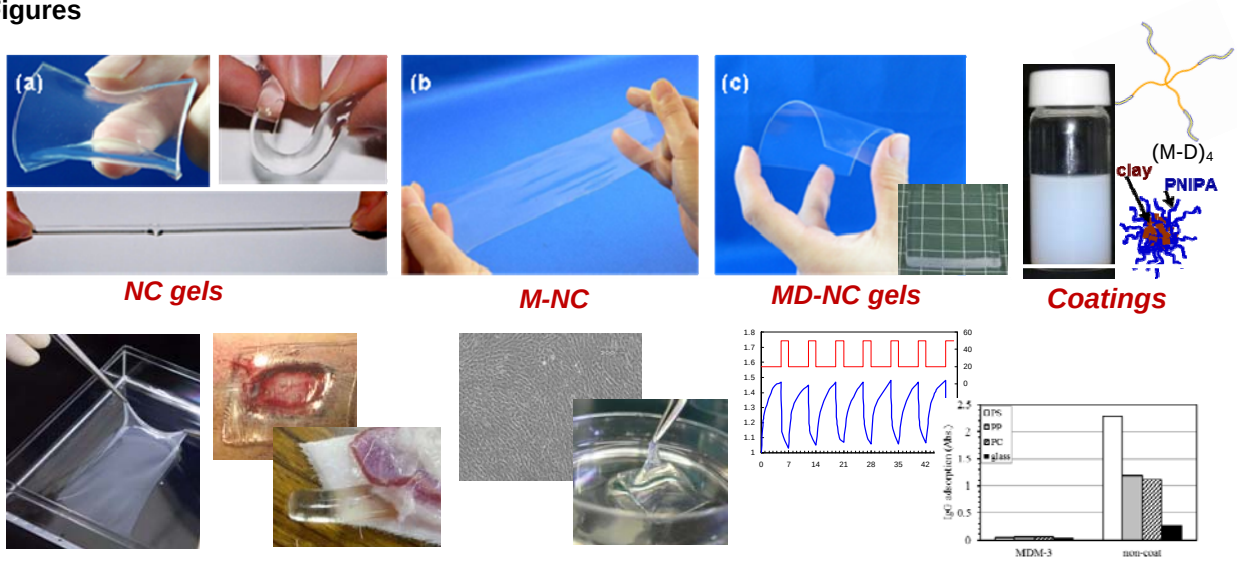
Figures



Soft nanocomposite (NC) materials and their biomedical applications