Editorial

The Prospects of Nanomaterials on Healthcare Technology

The traditional idea of dealing materials is to know the relationship among properties, process and microstructure. However, along the development of nanomaterials for medical applications, the research communities become aware of the sciences in nano-scale scenario [1,2]. Likewise, the interplay between nanomaterials and living organism is being unwinded using sophisticated methods and instruments [3,4]. In recent years, the revolution of healthcare technology is considered the most important topic for the elderly populations around the world. Furthermore, these efforts are being translated from the nano-science research to clinical applications for more effective and safe treatment in clinic setting [5,6].

This thematic issue covers the original articles reporting various morphologies of nanomaterials, including nanoparticles, nano-coating, nano-fibers, and membranes. H. Wang and K. Dimitrov described a novel method to conjugate immunoglobulin to gold nanoparticles. Because of good biocompatibility, hydroxyapatite(HAp) has been utilized not only in orthopedics [7]. H. C. Wu *et al*. prepared the nano-composite of HAp and iron oxide which made the composite superparamagnetic for the application of magnetic resonance imaging. Y. C. Lin *et al.* showed that HAp-silk porous scaffold can promote the proliferation of bone marrow derived mesenchymal stem cells. Regarding thermal stability of HAp subject to high temperature sintering, S. Ramesh *et al.* reported that a pure nanocrystalline HAp could be sintered without a compromise of mechanical properties. Similarly, F. H. Lin *et al.* reported montmorillonite, a type of clay mineral that was found to adsorb bamboo vinegar. The composite was found to deactivate porcine reproductive and respiratory syndrome virus. Y. T. Yang *et al.* showed that cellular photodynamic toxicity of hematoporphyrin could be adjusted when hematoporphyrin was encapsulated in either nano-sized polymeric micelles or liposomes. In the case of sub-cellular scenario, M. R. Rekha and C. P. Sharma reported the intracellular trafficking of non-viral gene vector made of polyethyleneimine-conjugated pullulan.

In view of the two-dimensional nanostructure, M. Liu *et al*. displayed that nano-coating of polysaccharides can resist thrombogenecity leading to a safe coating on the surface of Nitinol stents. The nano-fibrous mat, made of biodegradable polyesters, resembles the extracellular matrix of PC-12 cell lines as depicted in S. F. Chang's article. In this way, better neurite outgrowth was observed. To further mimic natural structure of extracellular matrix, A. Higuchi *et al*. immobilized nano-segments of gelatin, laminin, fibronectin and vitronectin on the surface polystyrene. In this work, amniotic fluid stem cells could respond to different nano-segments and, therefore, differentiate into osteoblast or neural cells. Similarly, surface grafting of the nano-segments on polyurethane surface was found to separate hematopoietic stem cells. In the molecular scale, T. Hashimoto and M. Yoshikawa reported that the polyamide membrane with aspartyl moiety could also be used to perform chiral separation of racemic mixtures which are very common to the biological systems.

In conclusion, the papers in the present issue encompass a wide range of materials science, say polymers, bioceramics and their composites. I hope you enjoy reading the articles in this issue. Thanks to the reviewers of this issue for improving the quality of the articles.

REFERENCES

[1] L. Moroni, J. R. De Wijn, C. A. Van Blitterswijk, Integrating novel technologies to fabricate smart scaffolds. *J. Biomat. Sci-Polym. E.* 2008; 19: 543-572.
[2] N. A. Peppas, Intelligent biomaterials as pharmaceutical carriers in microfabricated and nanoscale devices. *MRS Bull*. 2006; 31: 888-893.
[3] Y. Garcia, A. Breen, K. Burugapalli, P. Dockery, A. Pandit, Stereological methods to assess tissue response for tissue-engineered scaffolds. *Biomaterials.* 2007; 28: 175-186.
[4] K. Merrett, R. Cornelius, W. McClung, L. Unsworth, H. Sheardown, Surface analysis methods for characterizing polymeric biomaterials. *J. Biomat. Sci-Polym. E.* 2002; 13: 593-621.
[5] M. W. Freeman, A. P. Dervan, The path from bench to bedside: Considerations before starting the journey. *J. Invest. Med.* 2011; 59: 746-751.
[6] J. H. Sakamoto, A. L. van de Ven, B. Godin, E. Blanco, R. E. Serda, A. Grattoni, A. Ziemys, A. Bouamrani, T. Hu, S. I. Ranganathan, E. De Rosa, J. O. Martinez, C. A. Smid, R. M. Buchanan, S. Lee, S. Srinivasan, M. Landry, A. Meyn, E. Tasciotti, X. Liu, P. Decuzzi, M. Ferrari, Enabling individualized therapy through nanotechnology. *Pharmaco. Res.* 2010; 62: 57-89.
[7] M. F. Hsieh, L. H. Perng, T. S. Chin. Hydroxyapatite coating on Ti6Al4V alloy using a sol-gel derived precursor. *Mater. Chem. Phys.* 2002; 74: 245-250.

Dr. Ming-Fa Hsieh
Department of Biomedical Engineering
Chung Yuan Christian University
No. 200, Chung Pei Rd.
Chung Li 32023, Taiwan,
Tel: +886-3265-4550
Fax: +886-3265-4599
E-mail: mfhsieh@cycu.edu.tw