

## Hydrothermal Synthesis of TiO<sub>2</sub> Nanowire Array for Osteoblast Adhesion

**Young-Sik Yun<sup>1,2</sup>, Eun-Hye Kang<sup>3</sup>, Min-Eui Hong<sup>4</sup>, In-Sik Yun<sup>3</sup>,  
Yong-Oock Kim<sup>3</sup>, Jong-Souk Yeo<sup>1,2,\*</sup>**

<sup>1</sup>School of Integrated Technology, Yonsei University, Incheon 406-840,

<sup>2</sup>Yonsei Institute of Convergence Technology, Yonsei University, Incheon 406-840,

<sup>3</sup>Department of Plastic & Reconstructive Surgery, College of Medicine, Yonsei University, Seoul 120-749,

<sup>4</sup>Seoul Science High School, Seoul 110-530

Osteoblast is one of cells related with osseointegration and many research have conducted the adhesion of osteoblast onto the surface of implant. In the osseointegration, biocompatibility of the implant and cell adhesion to the surface are important factors. The researches related to cell adhesion have a direction from micro-scaled surface roughness to nano-scaled surface roughness with advancing nanotechnology. A cell reacts and sense to stimuli from extracellular matrix (ECM) and topography of the ECM [1]. Thus, for better osseointegration, we should provide an environment similar to ECM. In this study, we synthesize TiO<sub>2</sub> nanowires using hydrothermal reaction because TiO<sub>2</sub> provides inertness to titanium on its surface and enables it used as an implant material for the orthopedic treatment such as fixation of the bone fracture [2]. Ti substrate is immersed into NaOH aqueous solution. The solution are heated at 140~200°C for various time (10~720 minutes). After heat treatment, we take out the sample and immerse it into HCl aqueous solution for 1 hour. The acid treated sample is heated again at 500°C for 3 hours [3]. Then, we culture osteoblast on the TiO<sub>2</sub> nanowires. For investigating cell adhesion onto nanostructured surface, we conduct several tests such as MTT assay, ALP (Alkaline phosphatase) activity assay, measuring calcium expression, and so on. These preliminary results of the cell culture on the nanowires are foundation for investigating cell-material interaction especially with nanostructure interaction.

### Acknowledgements

"This research was supported by the MSIP(Ministry of Science, ICT and Future Planning), Korea, under the "IT Consilience Creative Program" (NIPA-2013-H0203-13-1002) supervised by the NIPA(National IT Industry Promotion Agency)

### References

- [1] B. Geiger, J. P. Spatz and A. D. Bershadsky, Environmental sensing through focal adhesions, *Nat. Rev. Mol. Cell Bio.* 10 , 21 (2009).
- [2] R. M Streilcher, M. Schmidt and S. Fiorito, Nanosurfaces and nanostructure for artificial orthopedic implants, *Nanomedicine*, 2(6), 861 (2007).
- [3] Yongnan Zhao, U-Hwang Lee, Myungkoo Suh, and Young-Uk Kwon, Synthesis and Characterization of Highly Crystalline Anatase Nanowire Arrays, *Bull. Korean Chem. Soc.* 25, 1341 (2004)

**Keywords:** Hydrothermal, TiO<sub>2</sub>, Osteoblast, adhesion, nanowire