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Nanowire Patterning for Biomedical Applications

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Nanostructures have a larger surface/volume ratio as well as unique mechanical, physical, chemical properties compared to existing bulk materials. Materials for biomedical implants require a good biocompatibility to provide a rapid recovery following surgical procedure and a stabilization of the region where the implants have been inserted. The biocompatibility is evaluated by the degree of the interaction between the implant materials and the cells around the implants. Recent researches on this topic focus on utilizing the characteristics of the nanostructures to improve the biocompatibility. Several studies suggest that the degree of the interaction is varied by the relative size of the nanostructures and cells, and the morphology of the surface of the implant [1, 2].

In this paper, we fabricate the nanowires on the Ti substrate for better biocompatible implants and other biomedical applications such as artificial internal organ, tissue engineered biomaterials, or implantable nano-medical devices. Nanowires are fabricated with two methods: first, nanowire arrays are patterned on the surface using e-beam lithography. Then, the nanowires are further defined with deep reactive ion etching (RIE). The other method is self-assembly based on vapor-liquid-solid (VLS) mechanism using Sn as metal-catalyst. Sn nanoparticle solutions are used in various concentrations to fabricate the nanowires with different pitches. Fabricated nanowries are characterized using scanning electron microscopy (SEM), x-ray diffraction (XRD), and high resolution transmission electron microscopy (TEM). Tthe biocompatibility of the nanowires will further be investigated.

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References

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