Supporting Information

Rapamycin-loaded nanoporous α-Fe_2O_3 as an endothelial favorable and thromboresistant coating for biodegradable drug-eluting Fe stent application

Ming Li [a,c #], Xuchen Xu [a, #], Zhaojun Jia [a], Yuying Shi [a], Yan Cheng [a,*], Yufeng Zheng [a, b]

[a]*Center for Biomedical Materials and Tissue Engineering, Academy for Advanced Interdisciplinary Studies, Peking University, Beijing 100871, China.*

[b]*China-America Institute of Neuroscience, Xuanwu Hospital, Capital Medical University, Beijing, 100053, China*

[c]*Department of Materials Science and Engineering, College of Engineering, Peking University, Beijing 100871, China.*

[#]These two authors contributed equally to this paper

*Corresponding author

Prof. Yan Cheng

E-mail: chengyan@pku.edu.cn

Tel&Fax: 86-010-62753404

The systematical studies on how to fabricate Fe_2O_3 nanotubes with different diameters on Fe by using anodic oxidation are rarely reported. Therefore, it will be helpful and necessary to research the effects of the fabrication parameters on the surface microstructures of the nanotube layers, such as voltage, time, temperature and water content.

1. The anodic oxidation of Fe

1.1 The effect of voltage

To study the effect of voltage, we maintained the temperature at 20℃, the oxidation time at 10min and with 3V% deionized water. The applied voltage were 20 V, 30 V, 40 V, 50V and the morphology of the samples were showed in Fig.1. The diameter of nanotubes increased progressively, from 20-50nm to 70-80nm, with the increase of voltage. The nanotubes formed at 20V were uneven with the diameter changed from 20nm to 50nm. Comparatively, the nanotubes formed at 30V, 40V and 50V were more uniform with the same diameter. Besides, the dissolution of top layer was observed in the Fig.1(d), indicated that high voltage could accelerate the oxidation process.

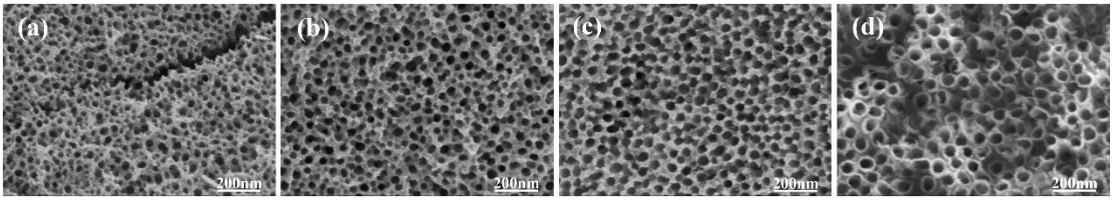

Figure.S1 SEM surface morphologies of 20V(a), 30V(b), 40V(c) and 50V(d) anodized samples.

1.2 The effect of time

In this part, the temperature, voltage and water content were kept at 20℃, 30V and 3V%. The oxidation times were 2 min, 5 min, 10 min, 15min and the morphology of the samples were showed in Fig.2. At first, many micropores were formed on the surface and the pore diameter increased with

the increase of oxidation time. The tube wall was thinning gradually and the dissolution of top layer was observed at 15min. It meant that the nanotube diameter had a maximum value under the fixed condition. With the increase of oxidation time, the diameter would increase at first, reached the maximum, and then the top layer began to dissolve.

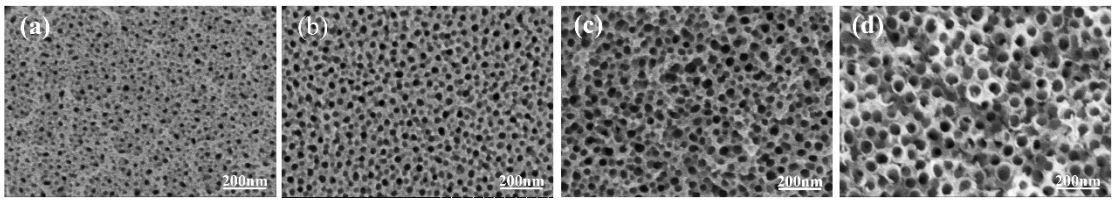

Figure.S2 SEM surface morphologies of 2min(a), 5min(b), 10min(c) and 15min(d) anodized samples.

1.3 The effect of temperature

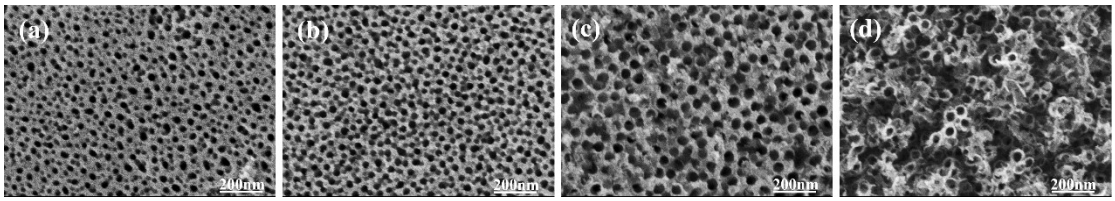

Figure.S3 SEM surface morphologies of 20℃(a), 30℃(b), 40℃(c) and 50℃(d) anodized samples.

To study the effect of temperature, we maintained the anodizing voltage at 30V, the oxidation time at 5min and water content at 3V%. The temperatures were 20℃, 30℃, 40℃ and 50℃. As showed in Fig.3, the diameters of the nanotubes increased obviously with the increase of temperature. At low temperature (20℃,30℃) the top layer was uniform and the diameter was small. In contrary, the diameter was much wider and many deposits were appeared at high temperature. In particular, as showed in Fig.3 (d), most of the nanotubes fell off when the temperature was 50℃. Therefore, it would be better to prepare Fe_2O_3 nanotubes at low temperature.

1.4 The effect of water

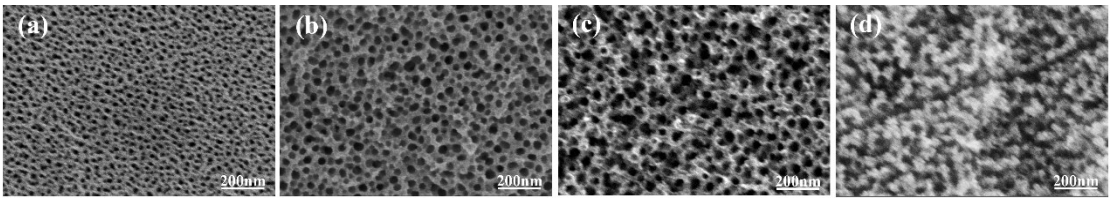

Figure.S4 SEM surface morphologies of 1V%(a), 3V%(b), 5V%(c) and 10V%(d) deionized water anodized samples.

In this part, the temperature, voltage and oxidation time were kept at 20℃, 30V, and 10min. At first, the anodic oxidation rate was accelerated and the nanotube got larger with the increase of water content. The nanotubes were even, showed in Fig. (a) and Fig. (b), when the water content were low. Then, the nanotubes became irregular under the 5% water content and no nanotubes were formed further when the water content was as high as 10%. Hence, we should use the solution that contained less than 5V% water to obtain the homogeneous nanotubes on the surface.

2. Cell response to nanostructured iron oxide

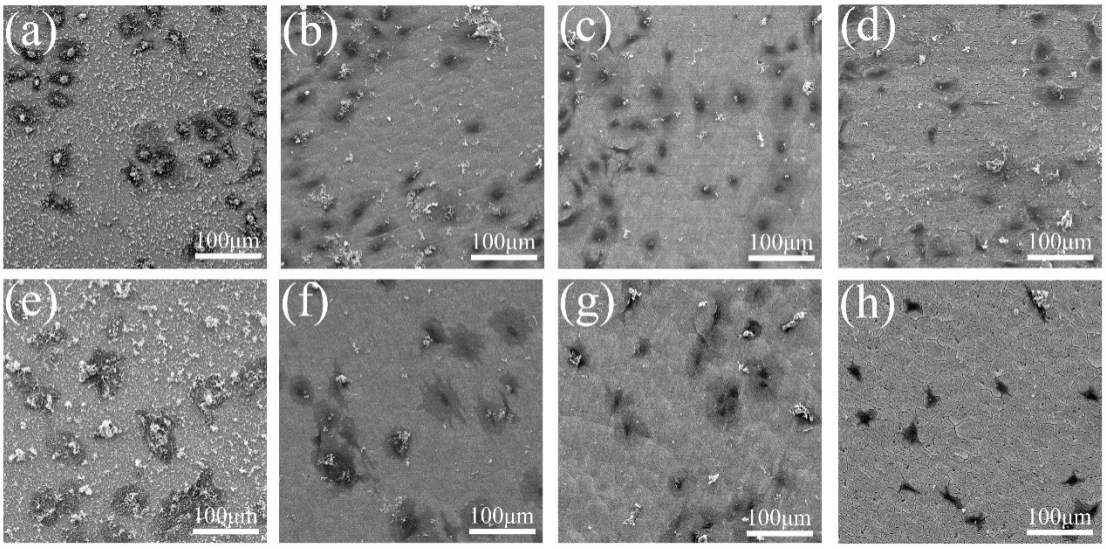

Figure.S5 SEM images of EC (a-d) and VSMC (e-h) cells after incubation for 12 h on pristine (a, e), 30 nm (b, f), 50 nm (c, g) and 70 nm (d, h) iron surface.