

Reusable hydroxyapatite nanocrystal sensors for protein adsorption

Author Motohiro Tagaya^{1,2}, Toshiyuki Ikoma^{1,2}, Nobutaka Hanagata¹, Dinko Chakarov³, Bengt Kasemo³ and Junzo Tanaka²

Affiliations ¹ Biomaterials Center, National Institute for Materials Science, Tsukuba, Ibaraki 305-0047, Japan
² Department of Metallurgy and Ceramics Science, Tokyo Institute of Technology, Tokyo, Tokyo 152-8550, Japan

³ Department of Applied Physics, Chalmers University of Technology, Göteborg S-41296, Sweden

E-mail tikoma@ceram.titech.ac.jp

Journal [Science and Technology of Advanced Materials](#) Create an alert RSS this journal

Issue [Volume 11, Number 4](#)

Citation Motohiro Tagaya *et al* 2010 *Sci. Technol. Adv. Mater.* **11** 045002
 doi: [10.1088/1468-6996/11/4/045002](https://doi.org/10.1088/1468-6996/11/4/045002)

Article **References**

Tag this article Full text PDF (2.42 MB)

Abstract The repeatability of the adsorption and removal of fibrinogen and fetal bovine serum on hydroxyapatite (HAp) nanocrystal sensors was investigated by Fourier transform infrared (FTIR) spectroscopy and quartz crystal microbalance with dissipation (QCM-D) monitoring technique. The HAp nanocrystals were coated on a gold-coated quartz sensor by electrophoretic deposition. Proteins adsorbed on the HAp sensors were removed by (i) ammonia/hydrogen peroxide mixture (APM), (ii) ultraviolet light (UV), (iii) UV/APM, (iv) APM/UV and (v) sodium dodecyl sulfate (SDS) treatments. FTIR spectra of the reused surfaces revealed that the APM and SDS treatments left peptide fragments or the proteins adsorbed on the surfaces, whereas the other methods successfully removed the proteins. The QCM-D measurements indicated that in the removal treatments, fibrinogen was slowly adsorbed in the first cycle because of the change in surface wettability revealed by contact angle measurements. The SDS treatment was not effective in removing proteins. The APM or UV treatment decreased the frequency shifts for the reused HAp sensors. The UV/APM treatment did not induce the frequency shifts but decreased the dissipation shifts. Therefore, we conclude that the APM/UV treatment is the most useful method for reproducing protein adsorption behavior on HAp sensors.

PACS [87.85.Qr Nanotechnologies-design](#)
[87.15.K- Molecular interactions; membrane-protein interactions](#)
[87.14.E- Proteins](#)
[87.85.J- Biomaterials](#)

Subjects [Biological physics](#)

Dates Issue 4 (August 2010)
 Received 24 四月 2010 , accepted for publication 29 七月 2010
 Published 20 九月 2010

Your last 10 viewed

- [Reusable hydroxyapatite nanocrystal sensors for protein adsorption](#)
Motohiro Tagaya *et al* 2010 *Sci. Technol. Adv. Mater.* **11** 045002
- [Theoretical investigation of methane adsorption onto boron nitride and carbon nanotubes](#)
Masoud Darvish Ganji *et al* 2010 *Sci. Technol. Adv. Mater.* **11** 045001
- [Low-energy cathodoluminescence microscopy for the characterization of nanostructures](#)
Benjamin Dierre *et al* 2010 *Sci. Technol. Adv. Mater.* **11** 043001
- [Characterization of Bi and Fe co-doped PZT capacitors for FeRAM](#)
Jeffrey S Cross *et al* 2010 *Sci. Technol. Adv. Mater.* **11** 044402

Users also read [What's this?](#)

- [Creating cold stationary molecular gases by optical Stark deceleration](#)
- [Sensitive gravity-gradiometry with atom interferometry: progress towards an improved determination of the gravitational constant](#)
- [Quantifying enzymatic lysis: estimating the combined effects of chemistry, physiology and physics](#)

[More](#)

Related review articles [What's this?](#)

- [Trend report on international and Japanese standardization activities for bioceramics and tissue engineered medical products](#)
- [Multifunctional nanoassemblies of block copolymers for future cancer therapy](#)
- [Stem cell technology using bioceramics: hard tissue regeneration towards clinical application](#)

[More](#)

Article links

[Post to CiteUlike](#)
[Post to Connotea](#)
[Post to Bibsonomy](#)

View by subject

All Subjects

All Dates

All journals This journal only

[Search](#)

Export

BibTeX format (bib)

Abstract References

[Export Results](#)

5. [Synthesis and characterization of \$\text{Eu}^{3+}, \text{Ti}^{4+}\$ @ZnO organosols and nanocrystalline c-ZnTiO₃ thin films aiming at high transparency and luminescence](#)
Tangi Aubert *et al* 2010 *Sci. Technol. Adv. Mater.* **11** 044401
6. [Development of novel thermoelectric materials by reduction of lattice thermal conductivity](#)
Chunlei Wan *et al* 2010 *Sci. Technol. Adv. Mater.* **11** 044306
7. [Present status of amorphous In–Ga–Zn–O thin-film transistors](#)
Toshio Kamiya *et al* 2010 *Sci. Technol. Adv. Mater.* **11** 044305
8. [Surface modification and characterization for dispersion stability of inorganic nanometer-scaled particles in liquid media](#)
Hidehiro Kamiya and Motoyuki Iijima 2010 *Sci. Technol. Adv. Mater.* **11** 044304
9. [Processing of polysiloxane-derived porous ceramics: a review](#)
B V Manoj Kumar and Young-Wook Kim 2010 *Sci. Technol. Adv. Mater.* **11** 044303
10. [Progress in engineering high strain lead-free piezoelectric ceramics](#)
Serhiy O Leontsev and Richard E Eitel 2010 *Sci. Technol. Adv. Mater.* **11** 044302