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Out of the liquid-into the vacuum

Michael Grunze

Dear Reader,

The first Volume of Biointer*phases* in March 2006 had an editorial by Greg Exarhos, then chair of the Publication committee of the American Vacuum Society (AVS), and me, entitled: A surface scientist's perspective on Biointer*phases*, or "Out of the Vacuum, into the Liquid" (the latter title I used in many talks and presentations). There we summarized the reason why we were starting an Open Access journal for the biointerface community, which to a large extent had their roots in the surface science community in the US and in Europe, and were trained as surface chemists and –physicists, but had no dedicated journal to publish and discuss their experiments. The new journal was a bold and forward-looking experiment. Now, this editorial I write for Biointer*phases* has a title that is vice-versa, see above. But before I explain, let´s have a look at a selected number of the 2013 papers published in Biointer*phases* to demonstrate the breadth and interdisciplinary nature of our journal, including both beautiful work on cells in the liquid, and highly sophisticated analytics done in a vacuum environment.

If I would have to pick a winner among the vacuum based spectroscopic methods for popularity in our Biointerphase community, it would be TOF SIMS, followed by XPS and NEXAFS. Articles in Vol. 8 describe TOF SIMS studies on the penetration of molecules of human skin, for the characterization of NIH/3 T3 fibroblasts, for the analysis of osteoblast-like cells and their mineralized extracellular matrix on strontium enriched bone cements, for the quantification of calcium content in bone, and for probing the orientation of electrostatically immobilized cytochrome C (complemented by sum frequency generation spectroscopy experiments). XPS, FT-IRAAS, and NEXAFS spectroscopy, coming in second, were described in Vol. 8 to be used to determine the adsorption geometry of thymine/adenine diblock-oligonucleotide monolayers. A new technique to pattern protein layers is also vacuum based, i.e. helium beam shadowing, which allows high spatial resolution patterning of antibodies.

The majority of papers, however, do not involve vacuum based analytical techniques. Fluorescent microscopy was used to sense proteins in lipid bilayers with single virus particle sensitivity, and theoretical papers explain the aggregation of *Aspergillus niger* spores by electrostatics, discuss charge transport along proton wires, and in a modeling study biominerals formed by apatites and DNA were investigated. Of broader implication is a thermodynamic analysis of marine bacterial attachment to oligo (ethylene glycol)-terminated self-assembled monolayers, and a paper describing a way to reduce marine fouling by entrapped air. Whoever is interested in marine fouling should also look at a review on the interaction of marine fouling organisms with topography of varied scale and geometry.

A study on the effect of high vacuum on the mechanical properties and bioactivity of collagen fibril matrices combines "vacuum " and "liquid". Anne Plant and her group show, that high vacuum exposure does not mechanically or biochemically alter collagen in and thus hardly affects cell spreading. Thus, high vacuum exposure is "ok" for most non-hydrated macro-molecular systems, as long as living cells are not involved. The last paper of this volume is a perspective on "Are there sufficient standards for *in vitro* hemocompatibility testing of Biomaterials?" by Braune et al. Anyone interested in implants and tired of hearing or reading claims of the next "superior" biomaterial should read this perspective.

The articles having a major component on vacuum based analytical techniques make up about 20% of all papers in Biointer*phases*; the rest are more biological and biosensor oriented, not to forget the papers addressing biomaterial aspects or presenting theoretical and modeling studies. I think we can proudly say that the "bold" experiment started in 2006 achieved its goal, i.e. to provide scientists in all areas of biointerface science with a high quality journal for publications and communications.

We need both —liquid and vacuum— in our scientific area, and if you look again at the contents of Vol. 8, this is

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quite obvious; but one should apply vacuum only in (what I always called) "post-mortem" experiments.

Now let us go back to the first paragraph, and the title of my editorial: it is by no means a recommendation to change research methodology and do biointerface experiments in vacuum. However, the effective the end of 2013, Biointerp*hases* is being moved (by its owner, AVS) from SpringerOpen back to the American Institute of Physics (AIP) as a publishing partner, and will be distributed as a subscription based journal bundled with the other journals of the AVS, the *Journal of Vacuum Science and Technology* suite of publications and *Surface Science Spectra*. By this transition AVS will gain a seat on the AIP Publishing LLC governing board (which AVS does not have with BIP published by SpringerOpen). Vol. 8 of Biointer*phases* is the last volume to be fully Open Access, and the last volume that I am the editor of; I was retired with this transition. With the new publisher you will be able to publish your articles for free— but they will not be necessarily freely available anymore.

I will stay behind "in the liquid," where the real scientific challenges in our field wait to be solved. I will continue to be involved in biointerface research, publications, and the promotion of excellence in Biointerphase Science in Europe. Please feel free to contact me with questions or suggestions, but now use my e- mail address at the Karlsruhe Institute of Technology, michael.grunze@kit.edu.

Thank you for your patronage and support over the last seven years,

Yours sincerely,

Michael Grunze

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