Monday, May 11

1:30 p.m. HC-1 The Effect of Surface Topography on the Retention of Organic Soil and Microorganisms

A. Packer, P.J. Kelly, K.A. Whitehead, J. Verran, and G.T. West, Department of Biological Sciences, Manchester Metropolitan University, Manchester, United Kingdom

Wear of food contact surfaces through abrasion, cleaning and impact damage increases the surface roughness and introduces topographical features which may increase the retention of organic soil and microorganisms. This affects the hygienic status of the surface by providing protection for the microorganisms and interfering with disinfection protocols. To investigate this, surfaces with defined linear features were fabricated and coated with titanium to provide a uniform surface chemistry. Retention assays were performed using Staphylococcus sciuri and Escherichia coli. Using atomic force microscopy (AFM), it was shown that interactions between cell shape and surface feature size affected the force required to remove cells. In order to model realistic situations the Crock Meter was used to assess the microbial removal in the presence of an organic soil. The results showed differing levels of retention dependent on the topography of the surface and the presence of an organic food soil. For example, E. coli was retained poorly on titanium coated surfaces without the organic soil.

Monday, May 11

1:50 p.m. HC-2 Hydrogen-Free Tetrahedral Amorphous Carbon Coatings for Biomedical Implants

L. Haubold, M. Becker, T. Schuelke, and H.-J. Scheibe, Fraunhofer USA, East Lansing, MI; and G. Woodrough and J. Helmuth, Symmetry Medical Jet, Lansing, MI

Hydrogen-free tetrahedral amorphous carbon (ta-C) coatings represent the hardest and most wear resistant form of diamond-like carbon films. In addition to their exceptional wear performance these coatings provide corrosion resistance and biocompatibility, which makes them a desirable candidate for biomedical implant applications such as hip and knee joint replacements. A very efficient laser-controlled high pulse-current cathodic arc technology was used to deposit thick (up to 10 microns) ta-C coatings onto actual implant components made from cobalt-chromium steel. The components were tested in a commercial hip-joint simulator for corrosion and wear performance. One of the key factors that affect wear performance in biomedical implant applications is the surface roughness of the coated implant part. The paper presents process information and data on how the wear performance of the ta-C coating depends on the surface roughness.

Monday, May 11

2:10 p.m. HC-3 Sterilisation of Surgical Instruments Using Mini Electron Accelerators

G. Gotzmann and F.H. Roegner, Fraunhofer Institute for Electron Beam and Plasma Technology FEP, Dresden, Germany

Invited 40 min. Talk

Electron beam technology has been used for sterilisation applications for several decades. The process is accepted all over the world and complies with international standards (ISO 111-37/95). The aim of the development work at the Fraunhofer Institute for Electron Beam and Plasma Technology (FEP) is to develop in-line-capable systems that can be used both for sterilisation applications in production processes and also as a batch system. The rapid growth of the older population, as well as modern medical technology, requires the increased use of gentle and minimally invasive diagnostic methods and devices. The delicate construction of these devices makes the sterilisation more difficult. This is one of many reasons for more research into alternative conditioning processes for medical devices. The fitness for use of accelerated electrons for this range of sterilisation problems was studied at the FEP. To assess the success of sterilisation, approved microbiological methods were applied. Further energetic and morphological changes in the treated surfaces were estimated. The results of electron beam sterilisation were compared with those of traditional sterilisation methods. The results show that electron beam technology can become an alternative method for sterilization, e.g. of surgical instruments and other medical products. Further investigations are planned.

Monday, May 11

2:50 p.m. HC-4 Validation Concepts for a Biomedical Product

P.E. Gagnon and J. Gibbs, Corning Inc., Kennebunk, ME

Developing and manufacturing bio-medical products require a battery of upfront testing. As pharmaceutical companies develop more complex drugs, they rely more and more on product validation from manufacturers. This paper describes some of the validation testing needed to meet bio-medical requirements. These include: bioburden, biocompatibility, shelf life, class IV testing, pyrogen and discussions of USP testing.

Monday, May 11

3:10 p.m. HC-5 The Supersonic Jet Deposition of Metal-Polymer Films, in Particular for Anti-microbial Applications

A.K. Rebrov, R.V. Maltsev, A.I. Safonov, and N.I. Timoshenko, Institute of Thermophysics, Novosibirsk, Russian Federation

Gas jet deposition of thin films and nanoparticles has gained wide development in the last decades for different technical applications. The case in point is the synthesis of condensed deposits in the result of interaction of rarefied subsonic or supersonic jets with a target. The deposition can be run in free molecular, transition or continuum regimes. This paper presents the review of current elaboration of new gas jet deposition methods, the results of experimental investigations of polymer and metal-polymer film deposition, informative illustration on computational simulation of non-equilibrium processes in the gas-precursor flow and data on effect of silver-polymer coating, inhibiting some dangerous bacteria. The numerical simulation of interaction of supersonic flows with a substrate provides data on distribution of macroscopic thermodynamic parameters in the flow and characteristic of internal energy of molecules, where it is necessary. The study of synthesis of polymer films is oriented on deposition of teflon-like films from supersonic jets of C_2F_4 substrates with given temperatures. New possibilities are open with the use of the hot wire initiation of supersonic precursor flow. The gas jet deposition was used for synthesis of metal-polymer film by co-deposition from separated jets of C_2F_4 and mixture of silver vapor and argon. This coating destroys the Salmonella typhus completely.