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Poly(2-methyl-2-oxazoline)-based non-fouling thin films for biomaterial applications: Relating molecular architecture and resistance to protein adsorption and bacteria adhesion

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The development of non-fouling materials for biological and medical applications is a broad and expanding field of study. In this context, poly(ethylene glycol) (PEG) has been the most reported polymer for the coating of different surfaces to convey non-fouling properties. Nevertheless, several limitations of PEG-based technology have been reported. Alternative to PEG, we have previously shown that poly(2-methyl-2-oxazoline) (PMOXA) conveys non-fouling properties to the same extent as PEG. Briefly, poly(L-Lysine)-*graft*-PMOXA (PLL-g-PMOXA, was immobilized onto negatively charged surfaces through electrostatic interactions between the positively charged backbone and the negatively charged surface. Depending on grafting ratio (g = number of lysine residues per number of PMOXA chain), PLL-g-PMOXA formed polymer brush on the surface.

Here the hydration, the swollen thickness as well as the stretching of the brush were evaluated, and the homogeneity of the adlayers was probed. These parameters are then related to the adlayers capability to resist non-specific protein adsorption and bacteria adhesion. Methods used include highly surface-sensitive techniques i.e., optical waveguide lightmode spectroscopy (OWLS), quartz crystal microbalance/dissipation (QCM/D), and secondary ion mass spectrometry (SIMS).

Biography

Bidhari Pidhatika, 33 year old, got his bachelor's degree in Chemical Engineering from Gadjah Mada University (Indonesia, 2003), master's degree in Chemical Engineering from Chalmers University of Technology (Sweden, 2006), and doctorate degree in Surface Science and Technology from Department of Materials, ETH Zurich (Switzerland, 2011). During his doctorate research at EHTZ, he has worked on pretty much an inter-disciplinary topic ranging from polymer synthesis, surface modification (including polymer and biomolecule adsorption to surfaces), and surface characterizations by means of different kinds of techniques. This has provided him with an exceptional opportunity to get trained in broad range of disciplines ranging from synthetic organic chemistry to polymer chemistry and materials science; from surface physics and chemistry to biochemistry and microbiology. He has enjoyed working in the inter-disciplinary type of project because of his big desire to explore new research fields and techniques. He also enjoyed discussing with people with different scientific backgrounds.

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Enhanced field emission characteristics of PANI/MGB_2 nanocomposites

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The synthesis of polymer nanocomposites is an integral aspect of polymer nanotechnology. By inserting the nanometric inorganic compounds, the properties of polymers improve and hence this has a lot of applications depending upon the inorganic material present in the polymers. Synthesis of polyaniline based nanocomposites has led to a number of potential applications in electronic and optical devices, catalysis, analytical sensors, etc. Nanoparticles can be introduced into a matrix of polymer by different methods, the most common used strategies being the chemical and electrochemical routes. We have synthesized polyaniline (PANI)/MgB_2 nanocomposites by chemical route in different compositions and excellent field emission behaviour has been shown by them. These composites have been characterized by scanning electron microscope (SEM) and Fourier transform infrared spectrometry (FTIR). Detailed studies on the field emission for all composites with different concentrations of dopant are performed at room temperature and analysed with JE & FN plots. Comparative field emission results showed that highly doped nanocomposite has superior emission characteristics with a low value of turn on nanocomposites also reveal high current density and field enhancement factor in comparison to pure PANI. Fourier transmission infrared (FTIR) results supply the evidence for the occurrence of the polymer in its conducting state. The ease of synthesis route and interesting field emission properties recommend these composites as a promising material for field emission based applications in vacuum micro-nanoelectronic devices and also for plastic display industry.

Biography

Mushahid Husain is a senior Professor and Director, "Centre for Nanoscience and Nanotechnology" of Jamia Millia Islamia (Central University), New Delhi. He has delivered 90 invited talks at national and international forums. A number of popular talks on All India Radio and the National TV Channel (Doordarshan) have also been presented by him. Prof. Husain has about 170 research papers in reputed international journals to his credit. He has guided 30 Ph.D. students. He has also edited one book on "Advances in Physics of Materials".

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