Karin Larsson, J Material Sci Eng 2018, Volume: 7
DOI: 10.4172/2169-0022-C10-118

Karin Larsson

Uppsala University, Sweden

Diamond surface modification for biomolecule interactions in the design of medical implants

Avascular necrosis is a disease of cell death in joints, jaw, and hips due to lack of blood supply induced by burnt, inflammation or trauma, etc. The mainstream for curing these days are arterial infusion by partial drug delivery and the replacement of the whole joints by using artificial materials. The first method can only be applied at an early stage of the disease, and the curing results. So for more severe situations, the medical implants will become the only choice. With the need for an improved stability and biocompatibility of the medical implant materials, diamond has recently become interesting as a promising material. The combination of chemical inertness and biocompatibility makes diamond a good material, for e.g. biological applications. In order to promote localized cell adhesion and vascularization onto the diamond-covered medical implants, the prerequisite for pre-adhesion of growth factors onto the diamond surfaces is of largest interest to study more in detail. It is highly necessary that these investigations are performed on an atomic level. Therefore, theoretical simulations is a necessary complementary tool to aid in the analysis of experimental observations and to make recommendations for corresponding experimental studies. With the purpose to tailor-make the medical implant surface by utilizing diamond's unique properties, the present study has investigated the interaction between diamond and various biomolecules (BMP2, RGD, heparin, fibronectin, VEGF and angiopoietin). The combined effect of various surface plane and termination type (H, O, OH, and NH_2) has been of a special interest to study. Three different groupings where obtained with regard to adhesion strength. And all of these three groups showed different dependencies of the surface termination type. For all of these different scenarios, strong bond formations were observed. Evaluation of the methods used showed that the calculated trends in adhesion energy are highly reliable.

Biography

Karin Larsson is a Professor in Inorganic Chemistry at the Department of Materials Chemistry, Uppsala University, Sweden. She has received her PhD in Chemistry. The research was directed towards investigation of molecular dynamic processes in solid hydrates by using solid state NMR spectroscopy. Her scientific focus is on interpretation, understanding and prediction of the following processes/properties for both solid/gas interfaces, as well as for solid/liquid interfaces; CVD growth, interfacial processes for renewable energy applications and interfacial processes for e.g. bone regeneration (incl. biofunctionalization of surfaces).

karin.larsson@kemi.uu.se

Notes: