McGill University- Electrochemical Process to Chemically Functionalize a Stainless Steel Surface and the Improved Products Thereof

Published date: Jan. 20, 2011

Technology description

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A novel electrochemical process is used to functionalize a stainless steel surface by an alkanethiol self-assembled monolayer (SAM) being covalently bonded onto the surface. Various compounds such as, antibodies, bioactive proteins, pharmaceuticals or polymers can then be irreversibly immobilized using the monolayer film as a chemical link. The method is efficient in forming a very stable, irreversibly-attached COOH terminated surface film. The method also enables the formation of CH3, NH2 and OH terminated alkanethiols. This film was then used to immobilize extracellular matrix protein fibronectin to a 316L stainless steel surface. This fibronectin was irreversibly attached to the surface, and unlike adsorbed fibronectin, resisted detachment under sonication. The fibronectin-modified 316L stainless steel surface was shown to be significantly more (21-25% improvement) biocompatible towards attachment of endothelial cells (HUVEC) than a bare, unmodified 316L stainless steel surface.

Market Synopsis

Great efforts have been expended in the medical device industry to modify metallic stents in order to eliminate stent-induced and/or inflammation-induced restenosis, and to effectively deliver therapeutic agents to lesion sites. There continues to be a need for improved coated-stents. From GlobalData, the 2008 global market for coronary stents was US$4.94B, with a compounded annual growth rate (from 2000-2009)=9.1%. Other applications for our process and products are biosensors and industrial uses of stainless steel surfaces (e.g. piping, pressure vessels, tanks, machined parts) in harsh environments (e.g. wastewater treatment, pulp mills, nuclear power plants, chemical process plants).

City

Montreal

Industry

Advanced Materials

State/Country

Canada

Booth Number

117

Application area

SAM modified stainless steel surfaces have many invaluable uses including: controlling cell-surface interactions, reducing friction of surfaces, improving corrosion resistance of surfaces, enhancement of polymer adhesion to surfaces, and in sensors and microelectronics.

Institution

McGill University

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