

Deposition of Nanocrystalline Calcite on Metal Alloys by Cellular Biomineralization

Description:

These technologies feature a method for deposition of nano-crystalline calcite plates by specialized epithelial tissue or cells onto metallic surfaces, such as stainless steel or other alloys. This is the first demonstration of a novel crystalline material that is produced by animal tissues which can be produced in a highly controlled process. This material and its process for preparation is potentially applicable for producing novel biomaterials for organ and tissue regeneration, biocompatible implants for tissue repair, and bone and joint implants. These materials may be included in the next generation of environmentally benign antifouling, cellular adhesive and protective coatings. The cellular production of novel crystalline surfaces is ideal for improved pearl seeding in the pearl culture industry.

Applications

- Biomedical field - orthopedic implant coating (surface coatings to stimulate bone growth and wear-resistant coatings), dental coating (metallic inserts and polymer/ceramic caps), stents (drug-eluting porous ceramic coating and non-drug-eluting ceramic stents), intraocular ceramic material (ceramic lens), cell growth/tissue regeneration (synthetic bone growth material, synthetic tissue regeneration utilizing organic matrix proteins and synthetic bio-mineralization utilizing nanomaterial/nanocarbon/nano-composite scaffolding)
- Industrial field - ceramic coatings (thick and thin coatings), tribological coatings, optical coatings (thin, optically transparent and thicker, optically translucent coatings), nanomaterials (microencapsulation, nanoparticles), thermal protection, corrosive protection, porous coatings, non-porous coatings, optics, biological computing and biological semiconductors, cell biology based electronics

Benefits:

- Provides calcite layer to materials that require strong but lightweight protection
- Provides impact resistance, corrosion-inhibitive coating

Related Publications:

- Johnstone, Mary Beth, et al. "Towards Biomimetic Ceramic Coatings: Cellular Aspects Of Oyster Shell Biomineralization." *Journal Of Shellfish Research*. Vol. 28. No. 3. 2009.

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Additional Terms: Metallic Surface, Metal Alloys, Nanocrystalline, Calcite, Epithelial, Oyster, Insulin, TGF Beta Superfamily, Bone Morphogenetic Protein (BMP), Cell, Cellular Adhesion
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