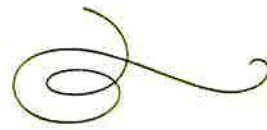
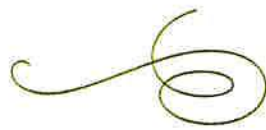


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The Director

of the United States Patent and Trademark Office has received an application for a patent for a new and useful invention. The title and description of the invention are enclosed. The requirements of law have been complied with, and it has been determined that a patent on the invention shall be granted under the law.

Therefore, this United States

Patent

grants to the person(s) having title to this patent the right to exclude others from making, using, offering for sale, or selling the invention throughout the United States of America or importing the invention into the United States of America, and if the invention is a process, of the right to exclude others from using, offering for sale or selling throughout the United States of America, products made by that process, for the term set forth in 35 U.S.C. 154(a)(2) or (c)(1), subject to the payment of maintenance fees as provided by 35 U.S.C. 41(b). See the Maintenance Fee Notice on the inside of the cover.

Andres Ibarra

DIRECTOR OF THE UNITED STATES PATENT AND TRADEMARK OFFICE



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(12) **United States Patent**
Wysocki et al.

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(54) **METHOD FOR OBTAINING A COMPOSITE COATING ON TITANIUM IMPLANTS FOR TISSUE ENGINEERING**

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(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

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A61L 27/32 (2006.01)
A61L 27/50 (2006.01)
A61L 27/06 (2006.01)
C25D 15/00 (2006.01)
C25D 9/08 (2006.01)
C25D 7/00 (2006.01)

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CPC **C25D 15/00** (2013.01); **A61L 27/06** (2013.01); **A61L 27/303** (2013.01); **A61L 27/32** (2013.01); **A61L 27/50** (2013.01); **C25D 7/00** (2013.01); **C25D 9/08** (2013.01); **A61L 2400/12** (2013.01); **A61L 2400/18** (2013.01); **A61L 2420/04** (2013.01); **A61L 2420/06** (2013.01); **A61L 2430/02** (2013.01)

(58) **Field of Classification Search**
None
See application file for complete search history.

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(57) **ABSTRACT**

A composite coating and method for preparing the composite coating on titanium implants for tissue culture and tissue engineering is provided. The implants are characterized in that the titanium component to be coated is placed in a aqueous solution containing calcium cations, phosphate anions, and dispersed carbon nanoparticles (such as single layer graphene oxide or graphene oxide) in an amount of about 0.05%-1.50% by weight relative to the total weight of aqueous solution. The dimensions of the dispersed graphene oxide should be around, but not limited to, 300-800 nm (X-Y), while their thickness is about 0.7-1.2 nm. The aqueous solution with carbon nanoparticles is prepared by mixing for at least 72 h in temperature in range 20-35° C. and sonicated before electrodeposition process. In the prepared solution is further placed titanium which acts as cathode element (may be the implant), and anode which can be, for example, a platinum rod. Between the cathode and anode is set a potential from -1.3V to -1.7V which results in coating formation by electrodeposition. The titanium implant before the electrodeposition process is treated in sodium hydroxide of HF to improve coating formation and thickness.

21 Claims, No Drawings