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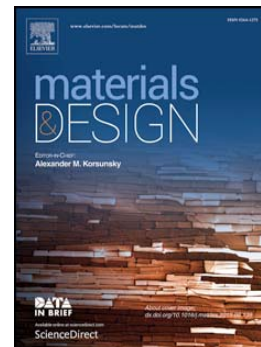
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Effect of ion implantation on the physical and mechanical properties of Ti-Si-N multifunctional coatings for biomedical applications

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Abstract

In the present work, multifunctional Ti-Si-N coatings have been deposited using CAVD method with the aim of studying their chemical, physical, structural and mechanical properties. Coatings of Ti-Si-N were modified by high-intensity ion implantation using copper ions with dose $D = 2 \times 10^{17}$ ions/cm² and energy $E = 60$ keV. The results demonstrated that ion implantation has an effect on the grain size, hardness, and Young modulus of the Ti-Si-N coating. Additionally, the effect of Cu implantation on the bioactive properties of coatings was investigated by contact antimicrobial assay. The results show a high release of Cu ions in the cultivation liquid and the low efficiency of the <20% Cu doping towards *E. Coli* bacteria. Our results bring understanding to the low dosage ion implantation of multifunctional surfaces towards applications and general drawbacks of ion implantation as bioactive tailoring method.

Keywords: TiSiN, Coatings, Antibacterial, Ion implantation, NEXAFS, CAVD

Introduction

Nowadays, one of the priorities in the development of science and technology is the creation and manufacture of novel materials. These efforts are fuelled by the increasing interest and applicability of the nanomaterials. An important area of research in nanomaterials and nanotechnology is the surface engineering, which includes the creation of multi-component (multi-

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