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Bio-borate glass doped with cerium oxide in the form of a thin film for improving surfaces of medical interest and obtaining method

Patent: A100615

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Work description

The invention relates to bio-borate glasses doped with cerium oxide (BBGi) in the form of thin films for the improvement of Titanium (Ti) surfaces of medical interest and to a method of obtaining them.

The doped BBGi according to the invention is composed of: vitreous network formers - 40...65% B_2O_3 and 2.5...10% P_2O_5, vitreous network modifiers - 15... 30% Na_2O and 20...30% CaO, as well as dopants with special properties - 1...3% CeO_2 and 0...1% SrO_2, in molar percentages.

The production process involves the following stages: volumetric and gravimetric dosing of raw materials, homogenization, mixture of raw materials dried in the oven, melting, glass annealing, glass mortaring, mixing with dimethyl sulfoxide (DMSO), freezing in liquid nitrogen and deposition on Ti substrates by matrix assisted pulsed laser evaporation technique (MAPLE), with the help of a KrF* excimer laser source, the substrates being placed plane-parallel in the deposition chamber.

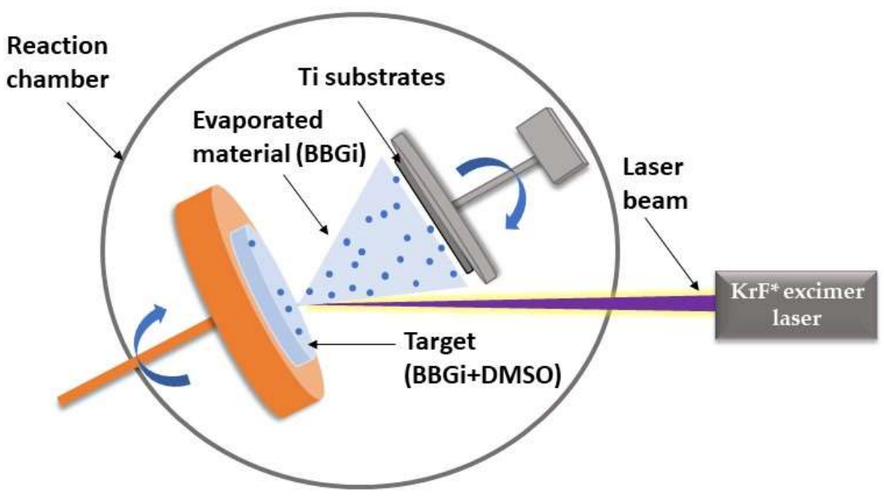

Figure 1. Simplified scheme of MAPLE experimental set-up

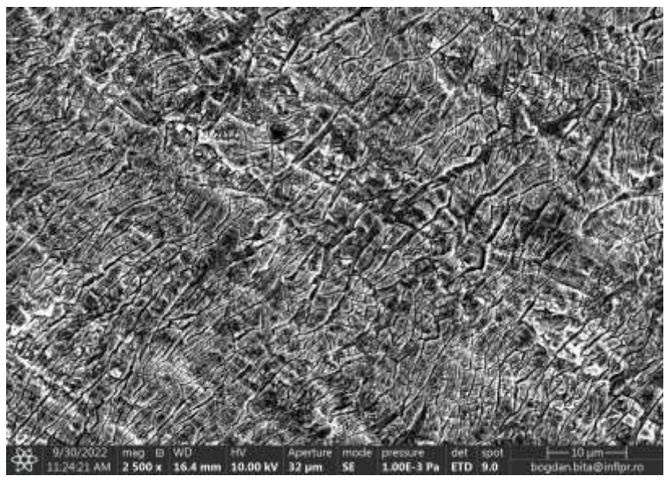

Figure 2. Scanning electron microcopy image of BBGi thin film deposited on Ti substrate

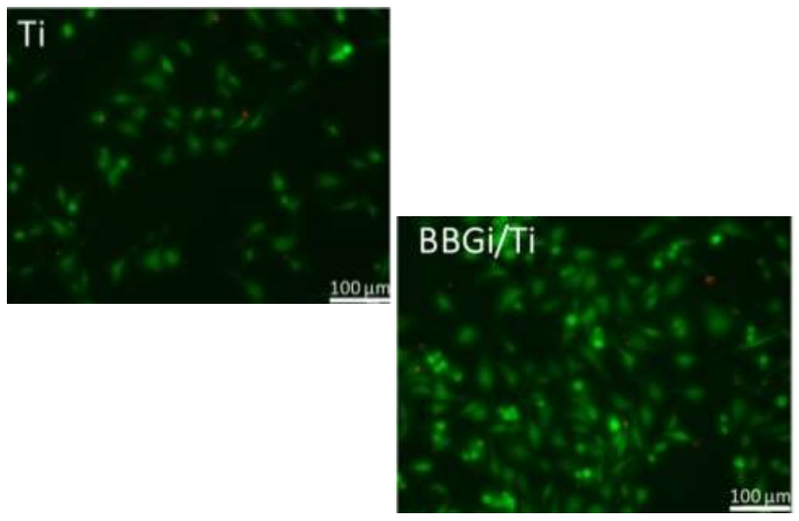

Figure 3. Live Dead test for BBGi thin film on Ti subtrate vs bare Ti

Socio-economic importance

The identified problem is related to the healing and restoration of bone tissue which are hampered and delayed due to various factors: the occurrence of infections associated with biofilm formation, the patient's age, metabolic processes, etc. The solution proposed to solve the problem is to cover the surfaces of medical interest, which, in contact with the affected bone tissue, should be biocompatible, and thus accelerate the healing process.

BBGi thin films deposited by MAPLE have the advantages of favoring a good adhesion of bone cells through the presence of irregularities on the surface (high roughness), as well as improving the biocompatibility of Ti surfaces.

Acknowledgements

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