TABLE 3. Values of corrosion quantities determined from potentiodynamic characteristics.

coating	$i_{0.5}$ (A/cm^2)	E_b (V)	E_{rep} (V)
uncoated	(4.3 ± 0.4) x 10^{-6}	1.047 ± 0.006	0.948 ± 0.001
TiO_2	(6.7 ± 1.1) x 10^{-9}	1.585 ± 0.067	0.759 ± 0.053
Ca/TiO_2	(3.4 ± 1.0) x 10^{-9}	1.598 ± 0.013	0.732 ± 0.001

Also, the breakdown potential values are significantly shifted toward the anodic direction, which confirms the protective properties of titanium dioxide coatings against pitting corrosion. These properties remain unchanged also after doping with calcium ions. Furthermore, for Ca-doped TiO_2 coating the average value of current density read at a potential of 0.5V is even lower, which is a beneficial effect.

Conclusions

Sol-gel method allows to obtain homogeneous coating of titanium dioxide from organic precursor. It is also possible to modify the synthesized sol-gel coating by calcium ion doping using calcium nitrate solution. The doping does not affect the thickness of the coating, but it affects the surface development and roughness of the coating. Synthesized TiO_2-based coatings exhibit anticorrosion properties in PBS solution both at corrosion potential as well as during the anodic polarization. The studies carried out at corrosion potential show that coatings containing calcium ions have a slightly weaker anticorrosive properties compared to pure TiO_2 coatings. Whereas no significant effect of doping were stated during anodic polarization.

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STEM CELLS AND THEIR DERIVATIVES – HOPES AND CHALLENGES IN REGENERATIVE MEDICINE

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Abstract

Major goals of contemporary regenerative medicine focus on improvement of irreversible damage of multiple organs and tissues by employing several approaches including recent achievements of cell-based therapies and tissue engineering.

Several types of stem cells (SCs) such as bone marrow (BM)- derived mesenchymal stem cells (MSCs), hematopoietic stem cells (HSCs) as well as SCs with multi- and pluripotent characteristics (PSCs) have been postulated as potential source of cells for therapy. Recently, embryonic stem cells (ESCs) and so called induced pluripotent stem cells (iPS cells) representing "genetically induced" SCs with high differentiation potential, have brought great hope to the field of regenerative medicine and clinical applications. When combined with modern accomplishments of tissue engineering including biocompatible carriers and scaffolds, SCs become leading targets for cell -based regenerative applications.

Although the variety of stem/ progenitor cells have been applied in experimental therapies of several organs injuries, there is still no agreement in scientific and clinical world which subpopulation/s of cells would be the most efficient in such treatment. Moreover, multiple obstacles needs to be overcome prior to optimal application of SCs in regeneration including optimization of ex vivo isolation and expansion conditions or limiting vast adverse features of some SC fractions such as teratogenic potential of ESCs and iPS cells.

Recently, stem cell- derived bioactive components such as cellular microvesicles (MVs) are postulated to play important role in mediating SC activity following transplantation. MVs representing bioactive components carrying SC- derived transcripts (mRNA, miRNA), proteins, enzymes and receptors may participate in tissue regeneration via stimulation of endogenous repair mechanism by activating endogenous target cells in damaged organs.

Thus, the newest trends in regenerative medicine would focus not only on combined applications of biocompatible materials with SC subpopulations, but also with their bioactive acellular components including microvesicles. Unquestionably, successful applications of stem/ progenitor cells and their derivatives in regenerative medicine would need to be safe, ethically acceptable and therapeutically efficient. Sources and application protocols for such optimal stem cell therapy are still being optimized and need scientific discussion.

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