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NANOSTRUCTURED TiO2 LAYERS PREPARED BY ANODIZATION: INFLUENCE ON THE EFFICIENCY OF PEROVSKITE SOLAR CELLS AND OSTEOBLAST CELLS GROWTH

TiO2 layers have been widely used in diverse applications. Some of them can be improved with the used of nanostructures. For example, in perovskite solar cells, the efficiency is increased if the TiO2 electron transport layer is nanostructured. In Ti medical inserts, in another hand, the TiO2 layer on top, responsible of the biocompatibility, can also promote osteoblasts proliferation when nanostructures are present. In both cases, the performance improvement was achieved after the optimization of the synthesis process and nanostructures characteristics, as will be shown in this work.

The TiO2 nanostructures were prepared by anodization. For the perovskite solar cells, Ti/FTO/glass films were placed in the anode and the electrolyte was based on NH4F (1.2 wt %). 30V were applied during lapses ranging from 3 to 14 min to obtain porous, then sponges and finally nanotubes (TNT). After annealing at 450℃/4 h, the samples exhibited a TiO2 anatase phase, pore diameters between 27 to 47nm, lengths from 330 to 700nm, a transmittance above 70% and a band gap of 3.30eV. A perovskite (CH3NH3PbI3) layer and then top Au electrodes were grown to conform the entire solar cell (Au/perovskite/TiO2/FTO/glass). The efficiency was successfully increased to 11.2 % for sponges and 12.8% for nanotubes, in comparison to a continuous (3.6%) or porous (8.6 %) TiO2 layer.

For the osteoblast proliferation, Ti/glass films were anodized with different voltages (25 to 45V), times (1 to 15min) and electrolyte concentrations (3 to 6 wt% NH4F). The samples were annealed at 450℃/4 h. The osteoblast proliferation was effectively increased in more than 50%, when nanostructured TiO2 layers, in comparison with the normal continuous layer, were used.

Keywords

TiO2, nanostructures, TNT, perovskite solar cells, cell proliferation

Reference

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