Understanding of electrochemical stability of TiO_2 nanotubes deposited with silver and gold nanoparticles in aqueous environment

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Nano-modification of titanium nanotubes (TNT), especially the incorporation of metal nanoparticles, is very common and allows to achieve unique properties. However, current research is focused on developing a new method of covering with metal nanoparticles and specifying their properties, completely omitting the mechanism of nanoparticle growth on nanotubes and their stability.

This work aimed to elaborate the titanium nanotube-silver/gold nanoparticle hybrid structure and examine its stability in an aqueous solution, i.e., phosphate-buffered saline (PBS) and Milli-Q water, as well as carry out the electrochemical characteristics of a hybrid structure.

The first significant observation is no differences in nanotubes-nanoparticles structure observed in PBS solution, which is commonly used by other authors. The obtained results measured in Milli-Q water indicated that gold nanoparticles were definitely less stable on titanium nanotubes surface than the silver nanoparticles. The optimal volume used in the washing procedure was 1-10 ml per 1 cm^2 of TNT for AgNPs/TNT and 10-33 µl per 1 cm^2 of TNT for AuNPs/TNT. Additionally, the electrochemical analysis confirmed that AgNPs/TNT are characterized by higher resistance and lower reactance, suggesting that this kind of functionalization is more appropriate for biosensing. However, AuNPs/TNT is characterized by more positive open circuit potential and redox stability, which is favorable for protein/drug immobilization.

Biography

Katarzyna Arkusz has completed his PhD at the age of 26 years from AGH University of Science and Technology in Cracow. She is the head of the Biomedical Engineering Division at the University of Zielona Góra. She has published more than 20 papers in reputed journals and has been serving as an editorial board member of repute. (Up to 100 words)