Ag@TiO_2 nanoparticles as photoacoustic contrast agent

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Titanium dioxide nanoparticles are promising candidates for applications in the biomedical field on the production of contrast images due to their photocatalytic properties [1]. However, it just absorbs light in the UV region. Deposition of noble metals as dopants is one way to overcome this. But generally, this synthesis involves the use of common strong reducing agents. This material can also be applied as a contrast agent in a promising imaging technique called Photoacoustic Microscopy (PAM)[2]. In this work, silver nanoparticles were deposited in TiO2 surface by a green sol-gel route. To study the influence of dopant, samples with 5 and 10% of silver, with calcination times of 2, 5, and 24 hours were prepared. The samples are characterized by IR, XRD, MEV, UV/Vis, and PAM. The infrared spectrum showed wide bands of stretching vibration of OH groups and flexion of Ti-O bonds. Diffraction peaks related to the anatase phase were predominant. The presence of silver was well distributed in titania surface. The deposition of silver improved the absorption profile of all samples to visible region, reaching NIR, in comparison with pure TiO_2. This improvement has a direct influence on the PAM analysis, where all the samples excited with 532nm showed uniform images with good contrast. On the other hand, excitation at 808nm generated greater variability in signal intensity. Samples with a higher concentration of silver (10%) were able to generate more intense signals when compared to samples with 5% silver. This is directly correlated to the light absorption capacity. These results demonstrate good potential for the application of the material as a contrast agent in photoacoustic imaging systems since the generated signal was also detected within the first biological window.

Key message: Photoacoustic Microscopy, Titanium dioxide doped with silver, contrast agent.

References:

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