**УДК 535.36**

# OPTICAL STUDY OF GREEN PRINTED $TiO_2$ NANOPARTICLES ON MIRROR

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**Introduction.** Titanium dioxide nanoparticles in anatase phase have attracted much attention due to their active photocatalytic and cytotoxic properties, and have promising applications in other fields such as biomedicine and catalysis. Combine $TiO_2$ nanoparticles with metal plate from a hybrid nanostructure has great promising optical response for biosensing, photocatalysis and many other applications. Considering the high efficiency field enhancement capability of pure metal structures and the low loss advantage of pure dielectric structures, the emergence of metal-dielectric hybrid structures can well combine the advantages of both. Dielectric nanoparticles on a metal plate can generate magnetic dipole modes that enhance the interaction between matter and light. Exploring the optical properties of this structure is important for expanding areas such as bioassay methods.

**Main part.** Self-assembly of synthesized colloidal $TiO_2$ particles onto gold substrates via green printing technology to form $TiO_2$-based hybrid metal dielectric structures. In order to investigate the optical properties of this structure, experimental and theoretical studies on the scattering of the titanium dioxide hybrid structure on mirrors under the 400 nm-1000 nm optical band were carried out. Besides, this chain type structure was investigated nonlinear properties by exciting by $Yb^{3+}$ femtosecond laser centered at 1047 nm.

**Conclusion.** By comparing the simulation and experimental results, the scattering spectra of the $TiO_2$ nanoparticle-based hybrid dielectric nanoparticles on mirror structures have distinct peaks at the same resonance wavelengths. And in the process of studying optical characteristics of the chain $TiO_2$ on gold substrate, the second harmonic generation (SHG) signal shows the nonlinear properties of the structures. Such printed hybrid $TiO_2$ nanostructures on a mirror can be further widely used for biosensing, photocatalytic and other applications.

**List of sources used:**


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