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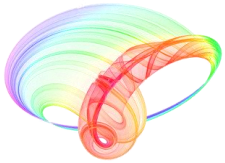

PHOTONICA2019

The Seventh International School and Conference on Photonics, 26 August – 30 August 2019, Belgrade, Serbia

& Machine Learning with Photonics Symposium (ML-Photonica 2019)

& ESUO Regional Workshop

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Editors: Milica Matijević, Marko Krstić and Petra Beličev

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Development of photo-sensitive nanocomposite system for controlled metallo-drug delivery in skin cancer therapy

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There has been a growing demand for development and improvement of cancer treatment in order to overcome disadvantages and limitations of traditional chemotherapy such as resistance, toxicity, and activity against a small number of tumor types. Photodynamic therapy is a rapidly developing cancer treatment that utilizes the combination of photoactive drug and/or carrier and light as an external stimulus to destroy tumors, achieve a maximum concentration of the drug on tumor site, reduce side effects of drug onto the healthy tissue, enable dosage control, and more effective treatment which could improve outcome of therapy [1].

We investigated possibility to use TiO_2 nanoparticles as a carrier for potential antitumor drug $[Ru(II)(dcbpy)_2Cl_2]$, *cis*-dichlorobis (2, 2'-bipyridyl-4, 4'-dicarboxylicacid) ruthenium(II). Nanocomposite system has been formed by binding of ruthenium complex to the TiO_2 nanoparticles. Components of the system are selected according to their preferences, such as biocompatibility, photo activity, and easy surface modification for TiO_2, and less toxicity, significant activity against cancer metastases, and activity on tumors that were resistant to a variety of standard chemotherapeutic agents for Ru-complexes. Both components of the system are also photoactive, therefore potential for system manipulation and use in photodinamic therapy has been investigated by irradiation with UV and visible light. Additionally, the feasibility of using this system as a light-triggered drug delivery system was shown on amelanotic melanoma cancer line.

The experimental results revealed a potential of nanocomposite system for long-term constant release of complex which is suitable for clinical practice. The further investigation of nanocomposite system indicated that it exhibited UV and red light susceptible drug release behavior [2]. More precisely, the system demonstrated slower complex release upon visible and increased release rate upon UV light illumination which was also in good correlation with the light–dependent cytotoxicity of the system demonstrated on amelanotic melanoma cancer line. The melanoma cancer cell death is enhanced by UV and reduced by red light in the presence of investigated nanocomposite system [3]. All obtained results suggested that nanocomposite system may have a potential use as a light sensitive drug delivery system in photodynamic therapy which could significantly contribute to development of more efficient and less invasive therapy of melanoma which is highly aggressive and deadliest form of skin cancer.

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