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Metalorganic magnetic nanoparticles as a targeted drug delivery system of Gd3+ ions for neutron-capture therapy against cancer

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The challenge in successful neutron-capture therapy against cancer has been the ability to keep proper concentration of Gd in tumor tissues during the irradiation. We developed a new method of producing nanoparticles based on cholesteric liquid crystal DNA-dispersion complexed with Gd in very high local concentration of gadolinium ions (up to 400 mg/ml inside particles). Their magnetic properties lead to active diffusion of Gd in tissue with the help of a strong magnetic field and keep those nanoparticles there for the desired amount of time. Due to the high local concentration of gadolinium, the impact of irradiation of the neutron-capture therapy occurs very locally (radius of influence is around 100 microns from particle) but highly effective and that preserves the healthy tissues from unwilling damage. One more potential way found was to actively target delivery of gadolinium ions in tumors. That is immobilization of nanoparticles by adsorption on macrophages. This way may help irradiate malignant cells within ascite tumors. The composition can be stored in the laboratory for 200 days without any change in physical properties. These nanoparticles have a great affinity to gadolinium ions, so have low toxic effect on living cells without irradiation.

Biography

Olga Vladimirovna Kondrashina, Ph.D. is science researcher in Voronezh State University, Russia. Her research interest is focused on nanoparticle for Gd neutron-capture therapy of malignant tumors. She has several publications in collaboration with Russian Academy of Science concerning use of cholesteric liquid crystalline dispersion from DNA as a raw material for nanoparticle manufacturing and some publication together with All-Russian Institute of Medicinal and Aromatic Plants (VILAR) concerning development of nanotechnology drug delivery system for targeting drug directly into injured tissues.

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Third generation photovoltaics

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The use of solar power comes as a production system of sustainable energy, since we consume the energy produced daily by the Sun. It contributes to reducing the dependency and consumption of fossil energies, reducing therefore, the corresponding gas emissions from its combustion that cause the greenhouse effect. Fossil energies have an expiration date as a source of energy, since they are consumed faster than they are generated by natural processes.

Photovoltaic is a semiconductor technology that directly converts sunlight to electricity. The electricity produced by the photovoltaic panel during the day, is stored and consumed later. Research over the past 50 years has resulted in the new PV materials.

This talk includes a brief review on the history, types of solar cells and their applications. Mesoscopic solar cells are one of the most promising photovoltaic technologies among third generation photovoltaics due to their low cost and high efficiency. The morphology of wide-band semiconductors, sensitized with molecular or nanosized light harvesters, used as electron collectors contribute substantially to the device performance. Recent results on the fabrication and characterization of ZnO based quantum dot sensitized solar cell are presented.

Biography

R. M. Mehra has completed his Ph.D. at the age of 28 years from University of Delhi, Delhi, India and postdoctoral studies from Nagoya University, Nagoya, Japan as research fellow of Japan Society for Promotion of Sciences. He is HoD, Department of Electronics and Communication Engineering, advisor, Learning Resource Center and Dean Research, Sharda University. He has published more than 170 papers in SCI journals with more than 1600 citations with h-index 20 (SCOPUS). He is serving as editorial board member and reviewer of reputed journals. He has widely traveled abroad for research and teaching assignments to universities in USA, Japan and Europe. He has chaired Semiconductor Society (India) and presently secretary of the society.

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