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Photothermal effects in Au-nanoparticles due to laser excitation of their surface plasmon resonance

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Abstract

Metal nanoparticles show the ability to generate heat under optical illumination. The light to heat conversion is especially strong if the nanoparticles are excited by a laser frequency corresponding to their surface plasmon resonance position. This photothermal effect is of great interest because the heat generated in metal nanoparticles, especially in gold nanoparticles, can be used in various biomedical applications such as imaging, drug delivery and therapy.

Part of our research consists in the synthesis of Au-nanoparticles with various ligand shells best suited for biomedical applications. A characterization by UV-Vis spectroscopy, Dynamic Light Scattering, and Transmission Electron Microscopy in regard to quality, size, size distribution, and stability determines their suitability for the photothermal experiments. This light to heat conversion experiments are carried out with a 532nm, 300mW laser. The temperature change is investigated for sphere shaped Au-nanoparticles and nanorodsin dependence of particle size, shape, and ligand shell type.

Many potential medical applications require specific cell targeting by Au-nanoparticles. Therefore a more sophisticated system has been developed consisting of Au nanoparticles crosslinked to a fusion protein. Results of the photothermal experiments for this system are presented as well.

Biography

Birgit Mellis received her Ph.D. degree in 2004 from the University of Duisburg-Essen in Germany. There she also conducted her postdoctoral studies in the field of Photonic Crystals, where she holds two patents. In 2010 she joined the Chemistry and Physics Department of the University of St. Thomas as an Assistant Professor of Physics. Her current research interest lies in the synthesis, analysis and biomedical application of metal nanoparticles, especially Au-nanoparticles.