

der to remove the catalyst remains and increase the number of potential active sites for thiamethoxam bonding. The adsorption conditions optimization was performed in 16 runs arranged in a fractional factorial design. This arrangement enables the rapid testing of 5 factors affecting the amount of adsorbed thiamethoxam: initial solution concentration, pH, temperature, contact time and MWCNTs dosage. In addition to the impact of these main factors to the adsorbed amounts of thiamethoxam, the applied design considers also the two-factor interactions. The results of the optimization indicate the greatest impact of thiamethoxam initial concentration, solution pH and contact time and their mutual interactions. The uptake of insecticide is favored in the conditions of higher initial solution concentrations, pH values and contact time as well as lower temperature and MWCNTs amount. The Langmuir and Freundlich models are employed to analyze the adsorption occurred in the experiment. The experimental data could be well fitted only by Freundlich isotherm which indicates inhomogeneous energy distribution on the surface of MWCNTs. It is probably a consequence of the presence of different functional groups attached to the tubes during the acid treatment.

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P060 – Photocurrents generated by photosynthetic reaction center protein/bio-nanocomposite systems

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A large number of studies have shown recently that photosynthetic reaction center proteins (RC) purified from purple bacterium *Rhodobacter sphaeroides* R-26 bind successfully to nanostructures while retaining their functional activity.^{1,2} The major goal of current research is to find the best systems and conditions for efficient photoelectric energy conversion and for the stability of these bio-nanocomposites. In our studies,

RC protein was bound to amine- and carboxyl-functionalized multiwalled carbon nanotubes (MWNTs) immobilized onto the surface of ITO by using specific silane. The binding of RC to MWCNTs results in an accumulation of positive and negative charges followed by slow reorganization of the protein structure after excitation.³ Both structural (SEM) and functional (absorption change and conductivity) techniques have shown that RCs can be bound effectively to amine- and carboxyl-functionalized CNTs. The photocurrent generated by the composite material is measured in an electrochemical cell designed especially for this purpose. The special electronic properties of the CNT/protein complexes open the possibility for several applications, e.g. in microelectronics, analytics or energy conversion and storage.

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P061 – Photoluminescence effect in double-walled carbon nanotubes

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The photoluminescence (PL) effect in Carbon Nanotubes has drawn the attention of many scientists to this subject for more than a decade now due to its possible applications, e.g. in biomedical environments such as markers.¹ Single-Walled Carbon Nanotubes (SWCNT) that were mostly used in these experiments are very sensitive to the degree of bundling which is necessary for the nanotubes to show PL, also the chemical environment plays an important role. Double-Walled Carbon Nanotubes (DWCNT) are expected to withstand these external factors since the outer tube would act as a shield for the luminescent inner tube but there has been a long controversy whether DWCNT can exhibit PL or not. The protecting outer tube is believed to cause nonradiative relaxation of the inner tube and therefore prohibit PL.

In this work, we show PL measurements of DWCNT produced with the Chemical Vapour Deposition (CVD) method. The as-produced samples were annealed in high vacuum at high temperatures which leads to the formation of linear carbon chains inside the inner tube of the DWCNT following.² The properties of the samples were investigated with Raman Spectroscopy, Optical Absorption Spectroscopy and measurements of the Photoluminescence. The carbon chains cause an increase of the PL signal similar to the PL enhancement of SWCNT filled with ferrocene.³ The degree of en-