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Carbohydrate Quantification on Glyco Gold Nanoparticles (GAuNPs) Surface using Photothermal Techniques

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The development of nanoparticles for diagnosis and treatment of diseases has increased in the last years. However, most of these nanostructures have not fulfilled the characteristics that the drug and molecular markers carriers need for instance, biocompatibility, low cytotoxicity, low immunogenicity and good biodistribution. Conversely, the glyco gold nanoparticles (GAuNPs) may be a good option because they do not require toxic reagents like a typical synthesis: hydrazine, silver nitrate, cetyl trimethyl ammonium bromide (CTAB) and chloride (CTAC), hydroquinone, among others. In addition, GAuNPs are stabilized with carbohydrates monomers, i.e. coated with carbohydrates, this increases the biocompatibility since these molecules are recognized and exchanged continually by biological systems metabolism. One of the main challenges to implement the use of GAuNPs as therapeutic drug carriers is the quantification of superficial carbohydrates, which help to calculate effective dosage in order to avoid side effects in patients with diabetes mellitus or cardiovascular diseases. However, until now, there is not documented techniques for this determination. In this work, we propose a method based on photothermal techniques, particularly the photo pyroelectric spectroscopy, it consists on the measurement at different distances of thermal waves generated by a sample due to the absorption of a modulated light from a laser, with this method, the optical absorption coefficient, β is obtained. It was found that there is a correlation between measured β and the carbohydrates concentration at 658 nm. Hereby, it was possible to quantify by indirect way, the carbohydrates on the GAuNPs surface.