

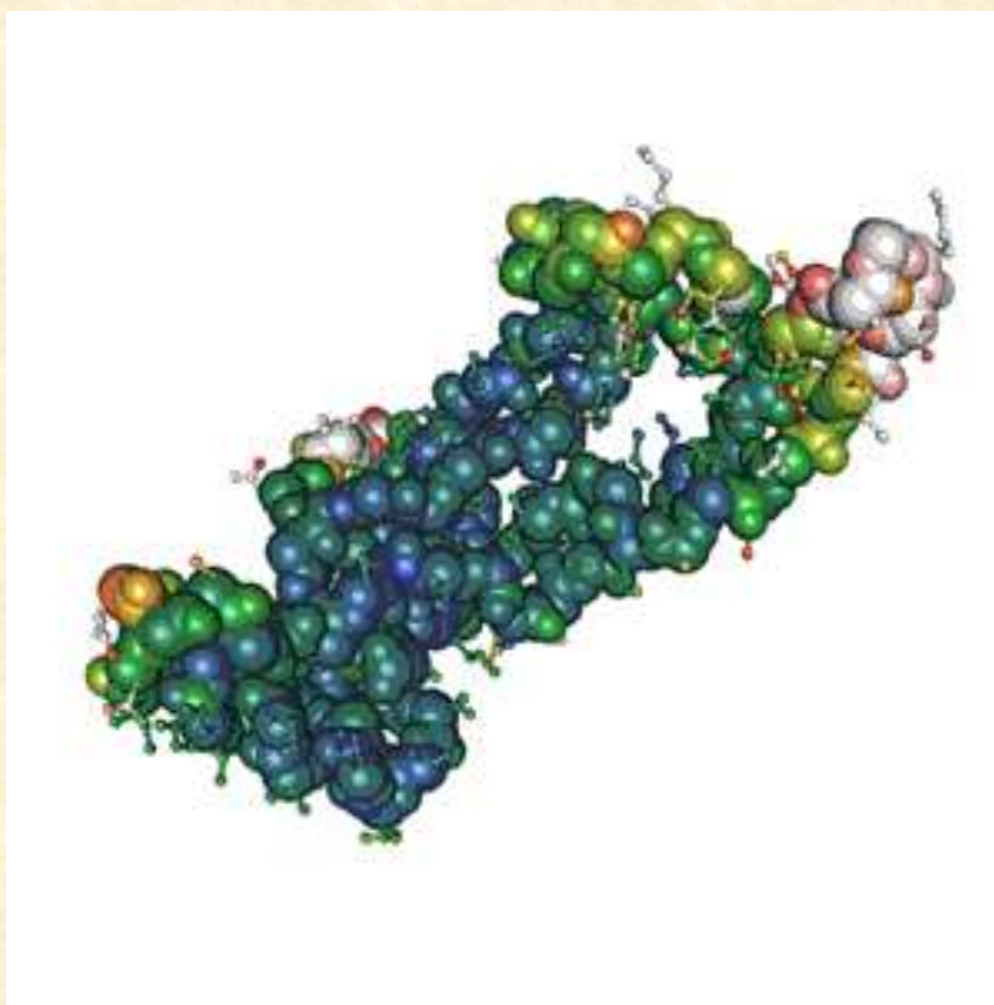
# Ferromagnetic nanoparticles as a perspective tool for the investigations and the therapy of the oncological diseases

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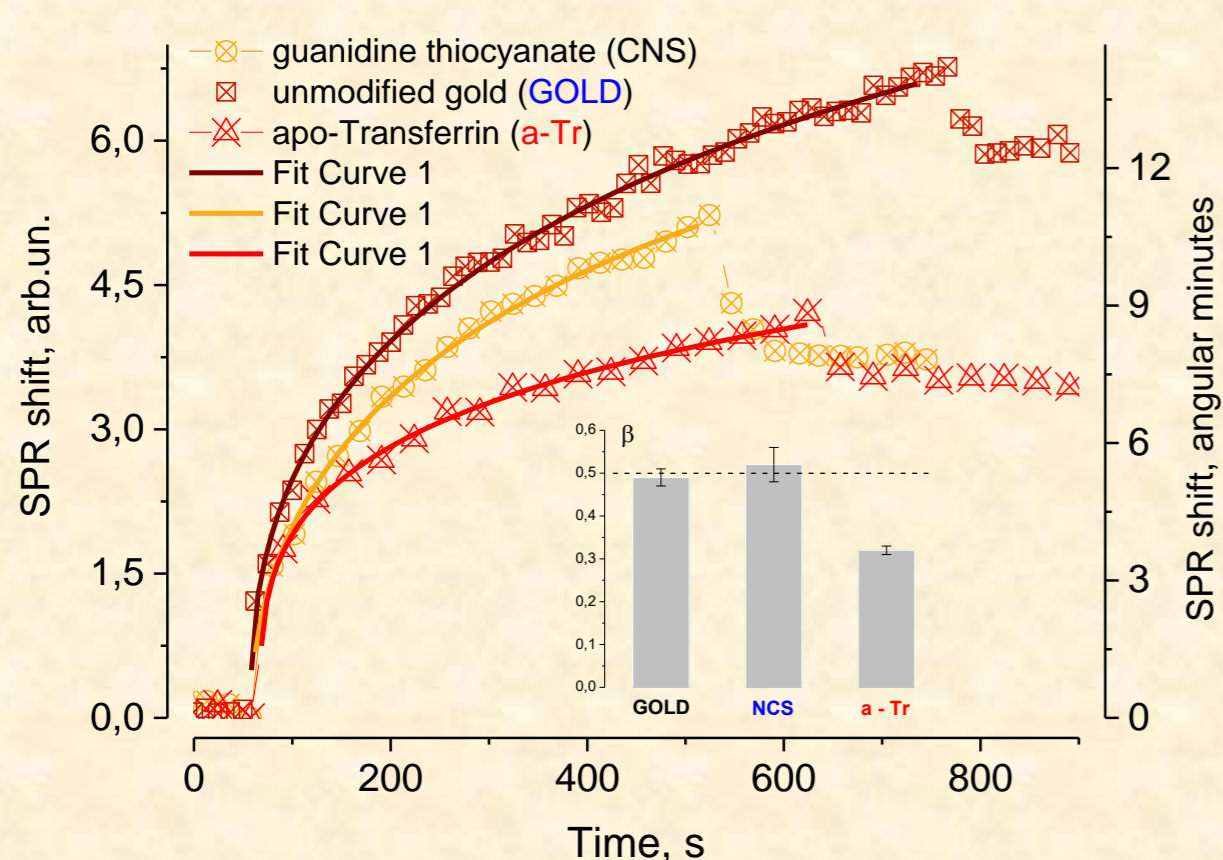
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Magnetic nanomaterials can be perspective tool for the development of the new approaches in medicine. Drug-loaded materials may be conjugated to magnetic nanoparticles by iron binding protein Transferrin/apo-Transferrin. Practical delivery of the modified magnetic nanoparticles to the area of specific tissues can be realized by the external magnetic field. Transferrin receptors are abundantly expressed in active and rapidly proliferating cells and thus targeting such proteins enables preferential localization of drugs in those cells.

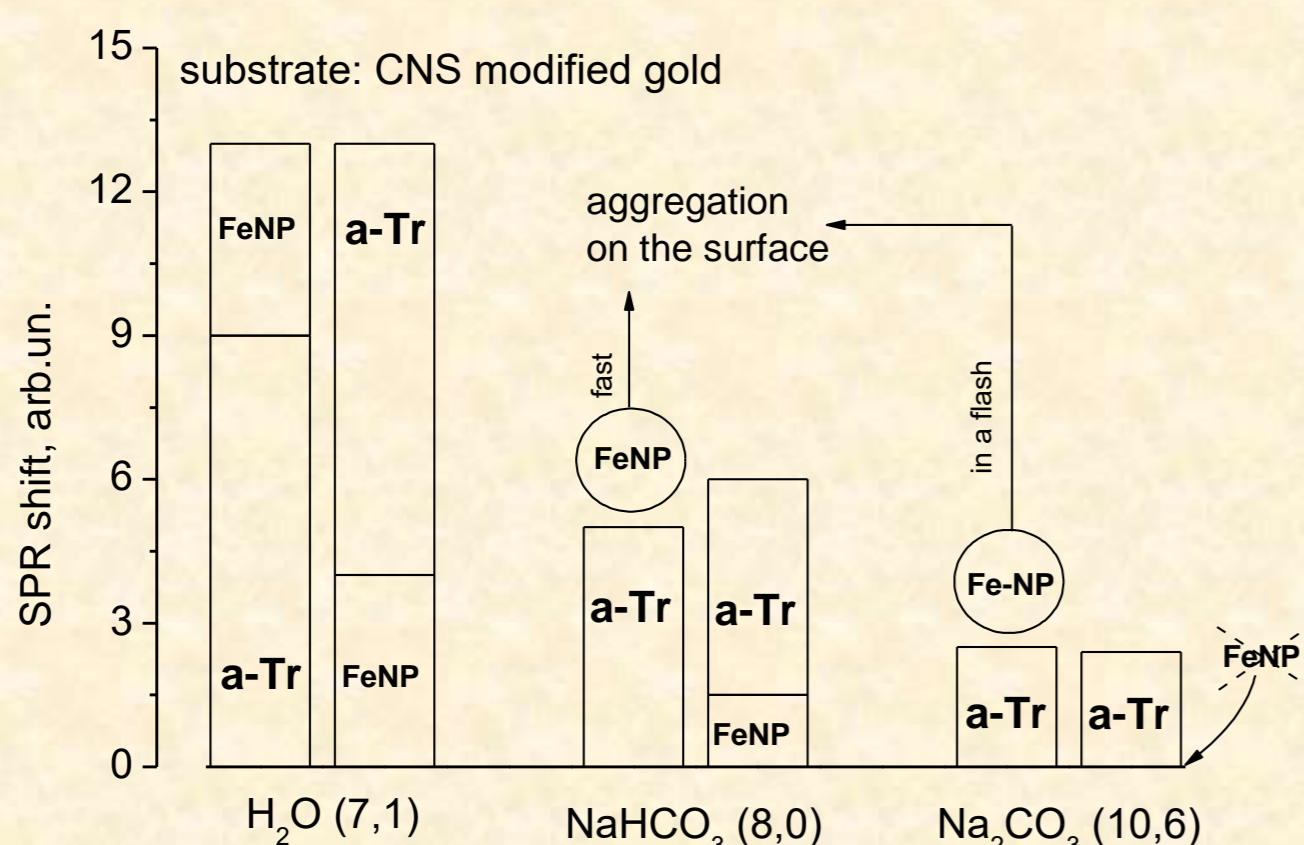


**Fig.1. Apo-Transferrin schematic image**

At the first step the adsorption of the nanoparticles at different surface types was investigated



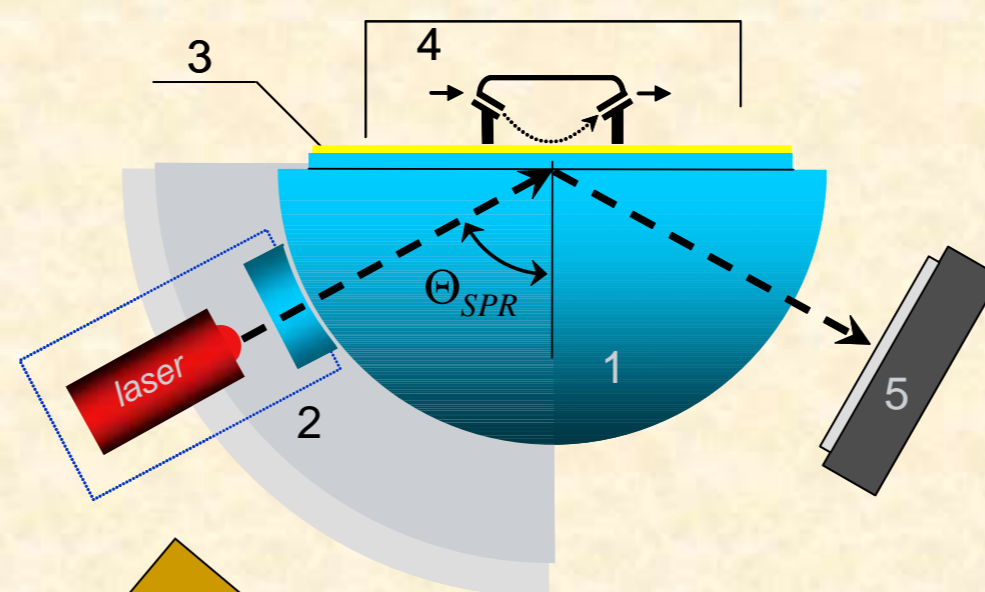
**Fig. 3. Kinetic curves for the interaction of Fe nanoparticles with different surfaces**



**Fig. 4. The schematic diagram of the core processes is illustrating the peculiarities of the interaction between Fe nanoparticles and apo-Transferrin on the surface modified by the guanidine thiocyanate (CH5N3-CHNS) on the pH level of the working solution.**

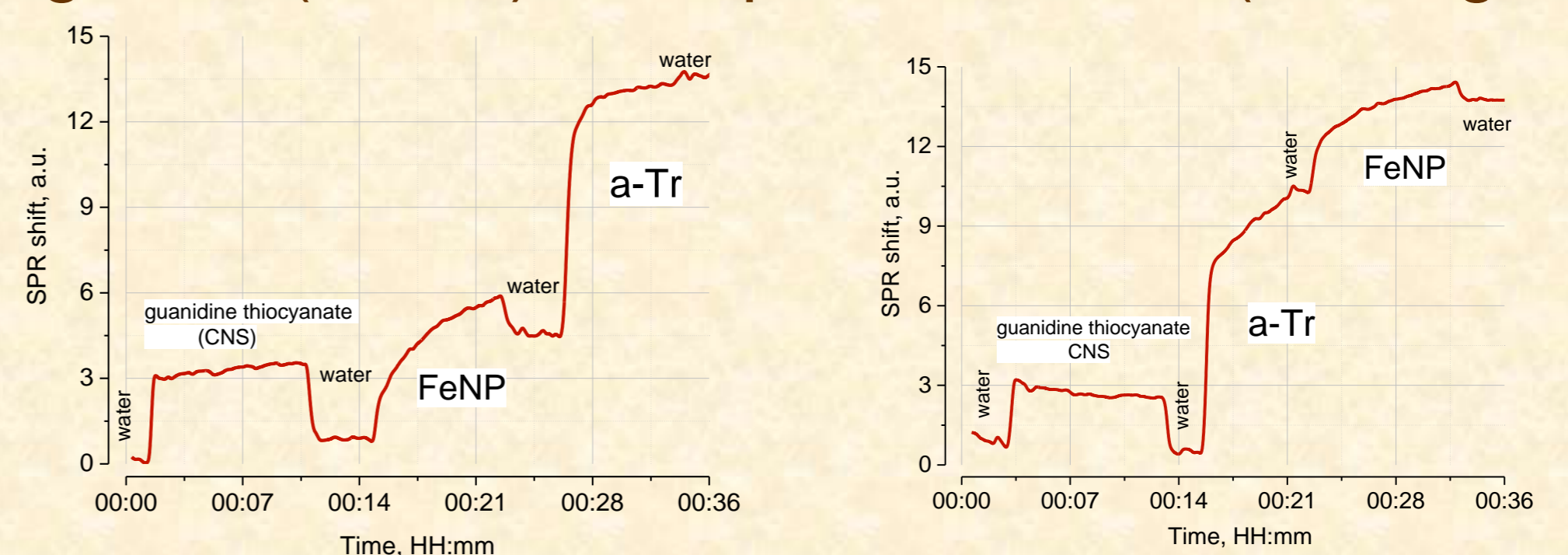
In the present study we discuss the first step under the way to drug delivery carrier - the formation of stable FeNP-apo-Transferrin conjugate.

An SPR spectrometer “BioHelper” was used for the investigation of the molecular complex formation



**Fig.2. Scanning SPR spectrometer “BioHelper - 01”**  
(V. Lashkaryov Institute of Semiconductor Physics, NASU, Kyiv, Ukraine)  
1 - glass prism  
2 - mechanically scanning semiconductor laser  $\lambda=650$  nm  
3 - chip  
4 - flow cell  
5 - strip-line photodiode

Next step was an experimental study of the effect of mutual orientation on the interaction between Fe nanoparticles of magnetite (C0/10) and apo-Transferrin (50 mkg/ml).



**Fig. 3. General course of experiment**

The present research shows that both surface properties as well as pH level may induce irreversible aggregation resulted in blood-vessel occlusion etc. It means that before comprehensive investigation in vivo preliminary studies in vitro are absolutely necessary to exclude a fortiori false compositions that are unstable under near physiological conditions