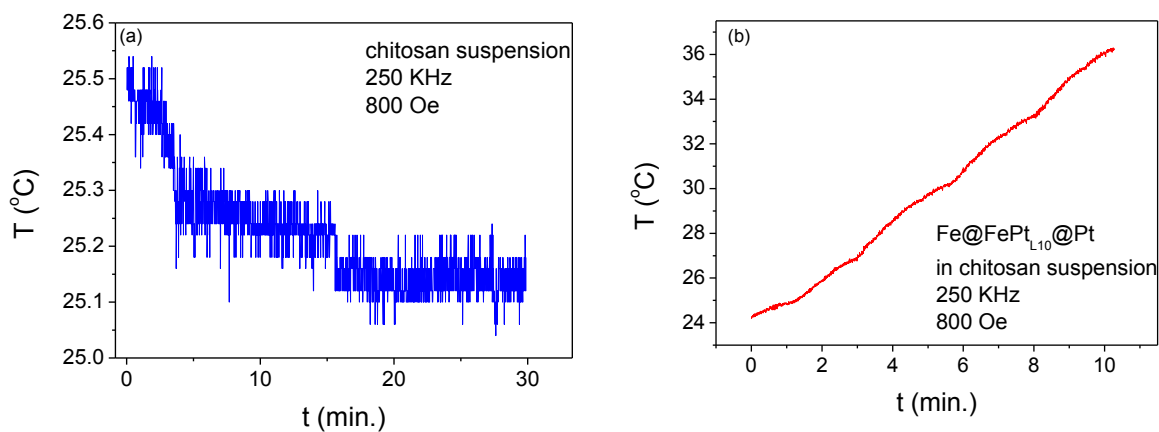


## Selected scientific results

### Stage 5 – 2015

**Objective 1.** Hyperthermia tests of Fe@FePt<sub>L10</sub>@Pt nanoparticles, having various FePt<sub>L10</sub> intermediate shells, dispersed in water based solutions and gels – hyperthermia tests.

The temperature increase over time for the bare dispersion medium and the nanoparticles solution, under the influence of AC magnetic field is presented in figure 1. One can see that in case of the chitosan solution the temperature is decreasing from 25.5 °C to 25.1 °C over 30 minutes exposure to AC magnetic field. This small observed temperature decrease is due to room temperature variation. In case of Fe@FePt<sub>L10</sub>@Pt nanoparticles dispersed in chitosan one can see a significant temperature increase over 10 minutes AC field exposure from 24.2 °C to 36.2 °C. These results indicate the possibility of hypethermia use of this type of nanoparticles. The functionalization that will be done in the following project stages will allow further tests in biological media.



**Fig. 1** Temperature increase over time for (a) bare chitosan suspension si (b) Fe@FePt<sub>L10</sub>@Pt nanoparticles dispersed in chitosan. The applied AC field was  $f=250$  kHz and  $H=800$  Oe.

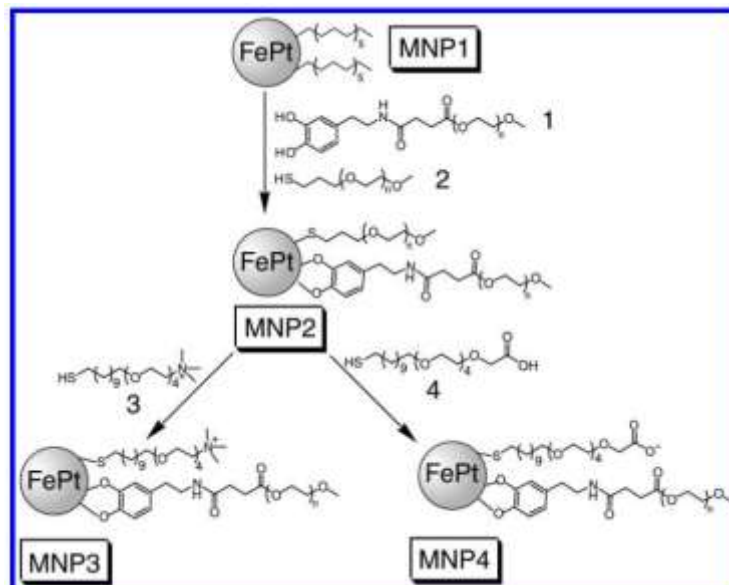
**Objective 2.** Fe@FePt<sub>L10</sub>@Pt, Fe@FePt<sub>L10</sub>@PPy(P3HT) and Fe@FePt<sub>L10</sub>@SiO<sub>2</sub>(TiO<sub>2</sub>) nanoparticles functionalization for magnetic molecular separation and uptake from water based solution.

Vancomycin functionalization:



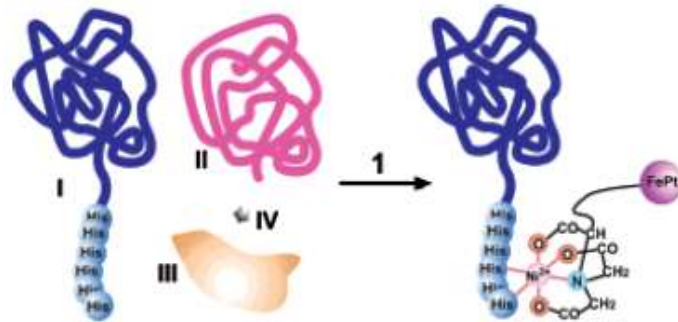
(a) Vancomycin attaching reaction to FePt nanoparticles  
 (b) FePt in hexane and a FePt-vancomycin in water [1].

Thiol groups and dopamine functionalization:



**Fig. 3** Thiol ligands and dopamine 1-4 used for FePt nanoparticles functionalization and the resulted nanoparticles MNP1-3 [2].

FePt nanoparticles functionalized with NTA nitrilotriacetic acid used as separation, transport or fixing agent.



**Fig. 4** Magnetic nanoparticles with modified surface that selectively bond to proteins (I: 6xHis protein; II: other proteins; III cells; IV: contaminated colloids) [3]

#### References:

- [1] K. McNamara, S. A. M. Tofail *Phys Chem Chem Phys* 17(2015)27981
- [2] R. Hong, N. O. Fischer, T. Emrick, V. M. Rotello *Chem Mater* 17(2005)4617
- [3] C. Xu, K. Xu, H. Gu, X. Zhong, Z. Guo, R. Zheng, X. Zhang, B. Xu *J Am Chem Soc* 126(2004)3392