



Univerzita P.J. Šafárika v Košiciach
Prírodovedecká fakulta
Katedra fyziky kondenzovaných látok



NANOVIR

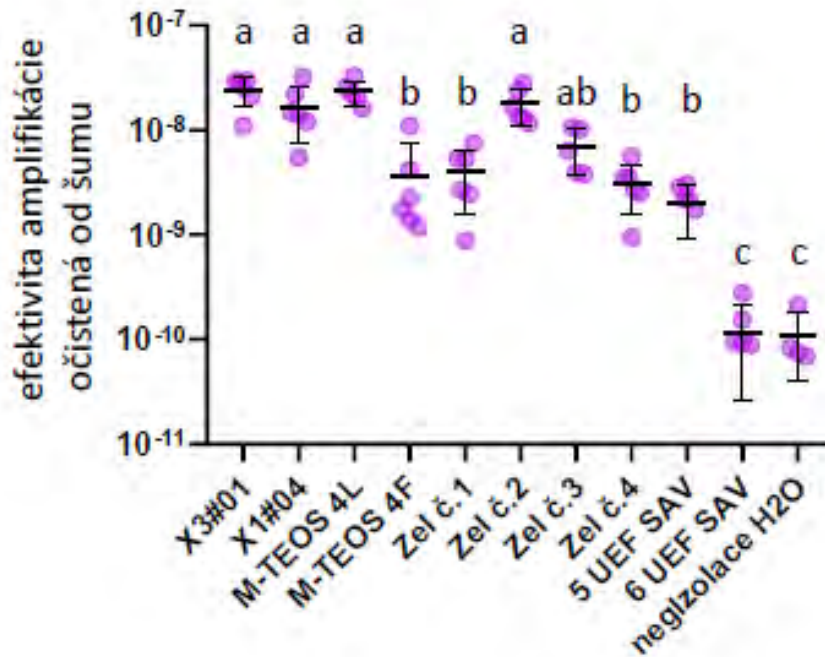
14.4.2021

Doc. RNDr. Adriana Zeleňáková, PhD.





NANOČASTICE FE₃O₄



* significance levels by one-way ANOVA with post-hoc Tukey HSD Test p-value<0,001



NANOČÁSTICE FE3O4



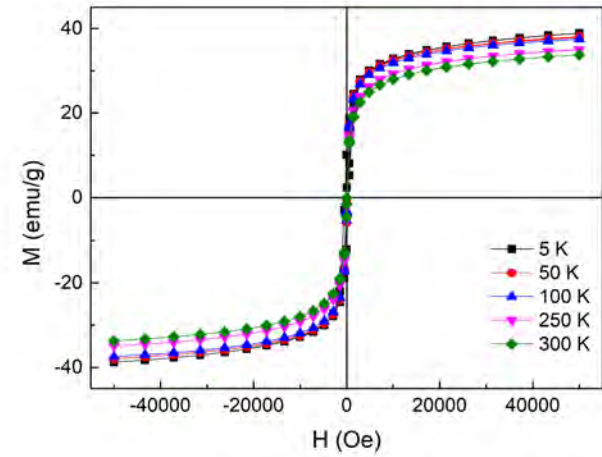
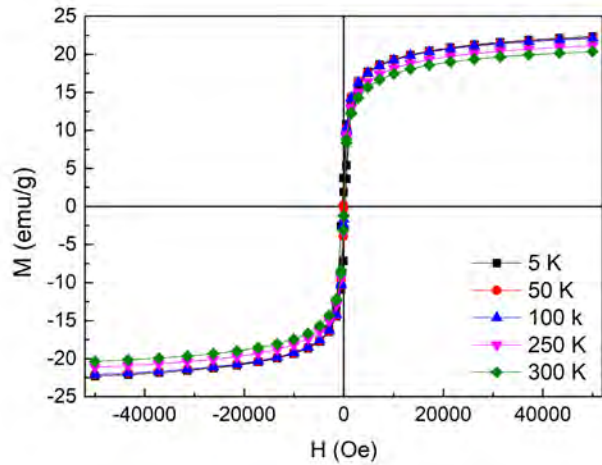
Rychlost usazování na magnety ve velkém objemu (při promývání)

Při promývání částic byly použity objemy 1-4 ml.

- Nejrychleji:
 - Vzorek č. 3 Zeleňák
 - Vzorek č. 4 Zeleňák
- Středně rychle:
 - Vzorek č. 2 Zeleňák
 - M-TEOS-4L
- Pomalu:
 - Vzorek č. 1 Zeleňák
 - 5 UEF SAV
 - 6 UEF SAV
- Nejhůře:
 - M-TEOS-4F – roztok se neprojasnil ani po 3 hodinách*

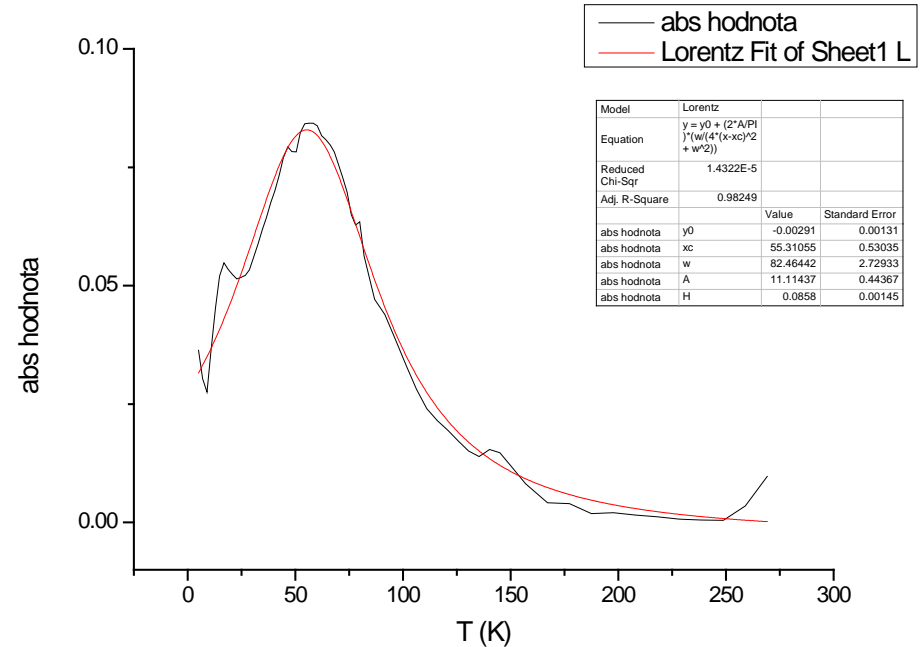
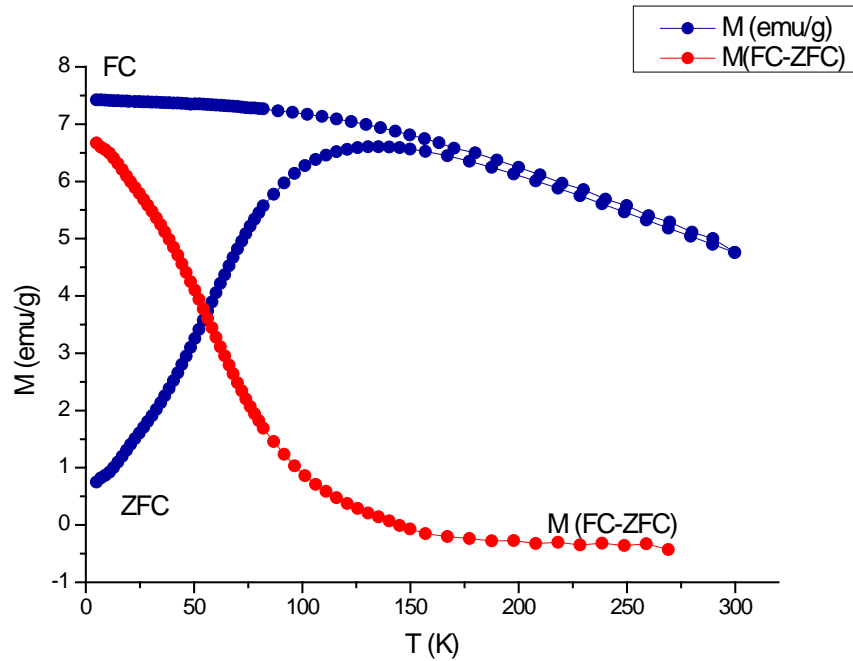


NANOČASTICE Fe_3O_4



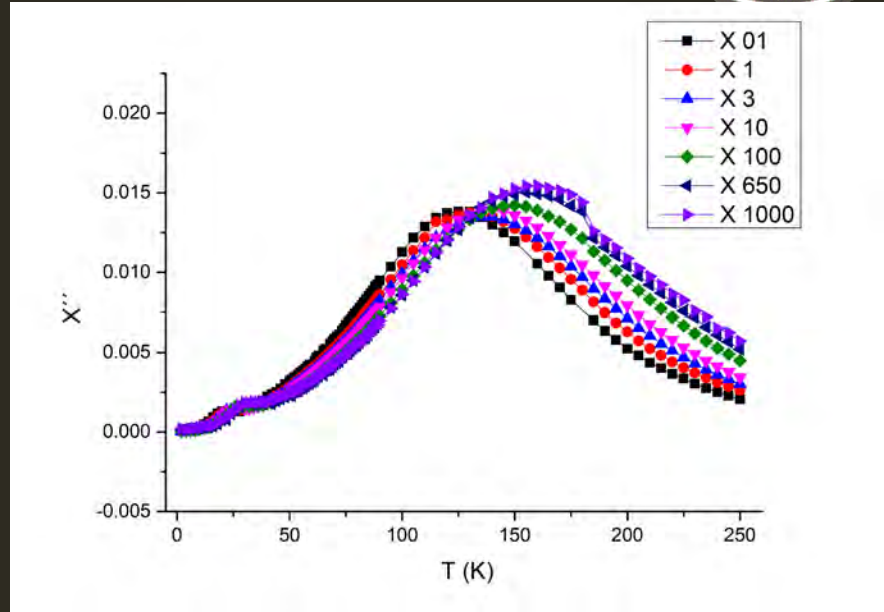
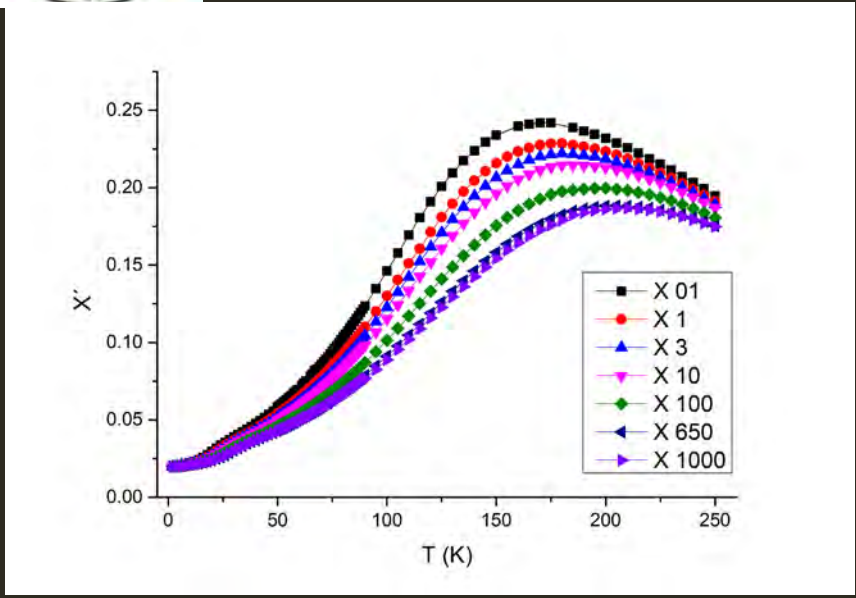


NANOČASTICE Fe_3O_4

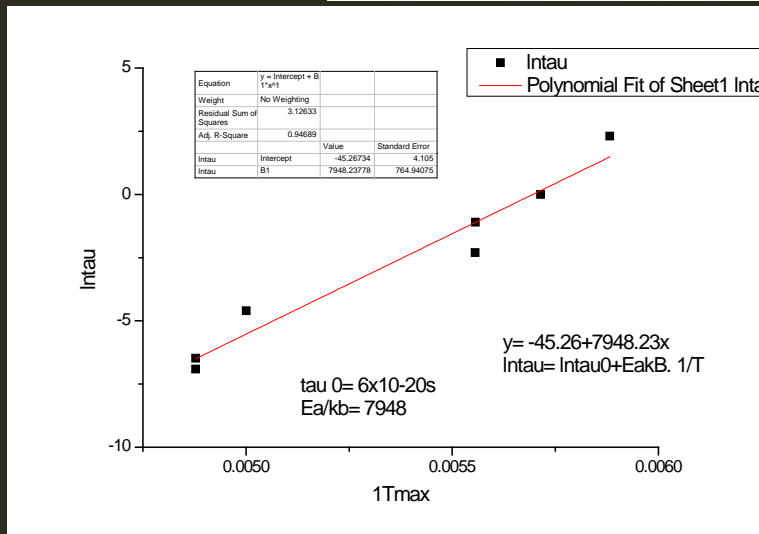




NANOČASTICE FE3O4



$$\tau = \tau_0 \exp\left(\frac{E_a}{k_B T}\right)$$





ŠTÚDIUM MAGNETICKÝCH VLASTN. A CYTOTOXICITY: DOTERAJŠIE MOŽNOSTI





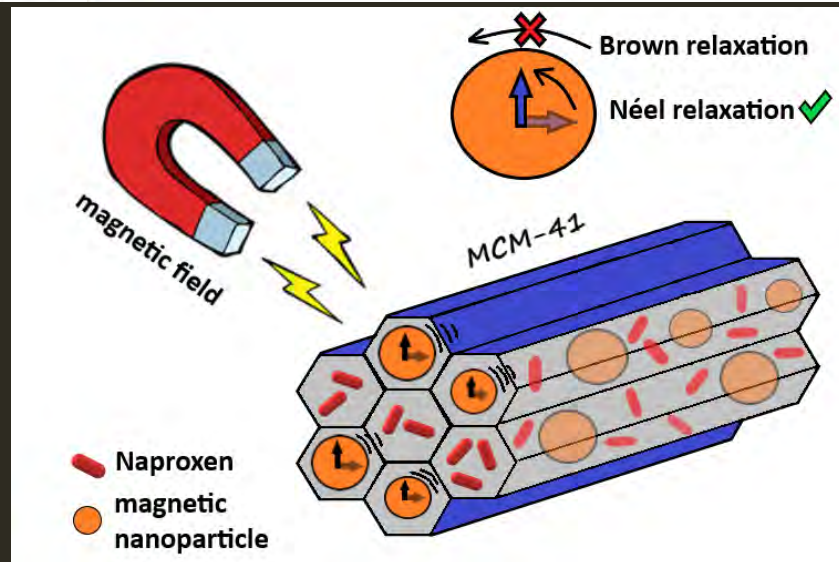
nanomaterials



Article

Magnetic Characterization and Moderate Cytotoxicity of Magnetic Mesoporous Silica Nanocomposite for Drug Delivery of Naproxen

Adriana Zeleňáková ^{1,*}, Jaroslava Szűcssová ¹, Ľuboš Nagy ¹, Vladimír Girman ¹, Vladimír Zeleňák ² 
and Veronika Huntošová ³ 

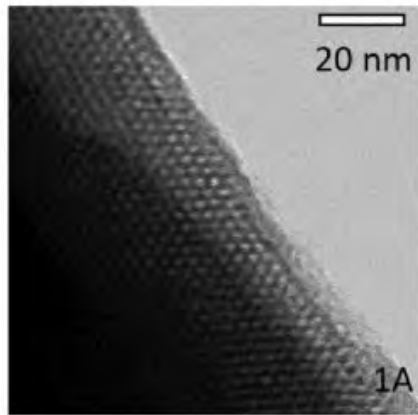




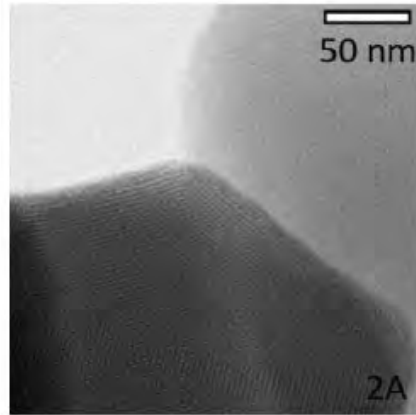
ŠTÚDIUM CYTOTOXICITY: DOTERAJŠIE MOŽNOSTI



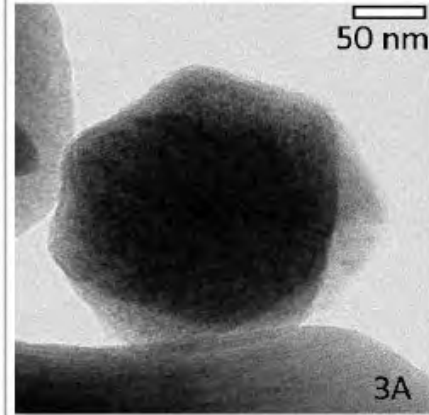
Sample 1



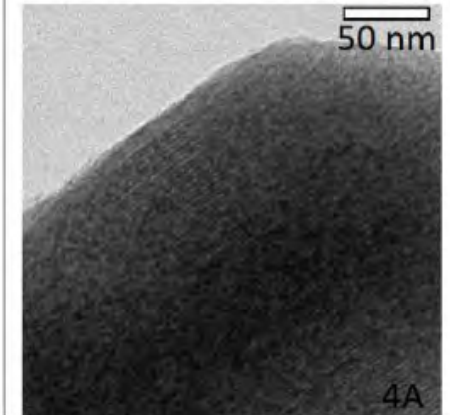
Sample 2



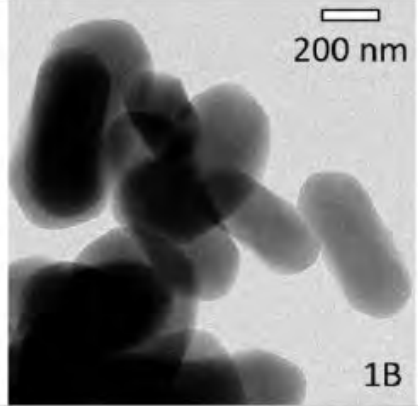
Sample 3



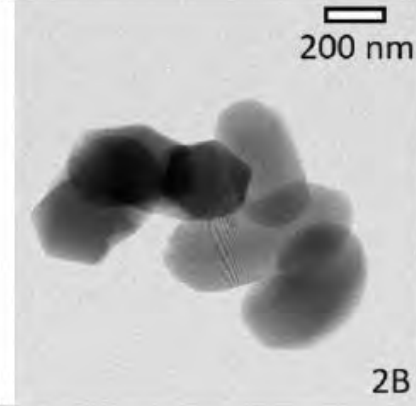
Sample 4



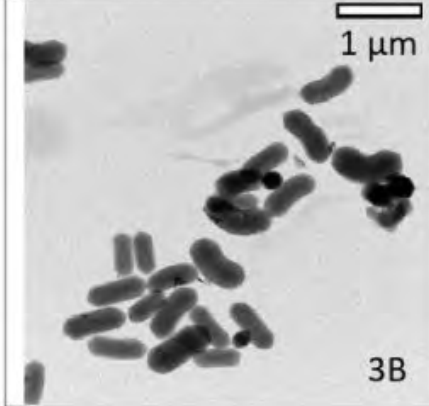
200 nm



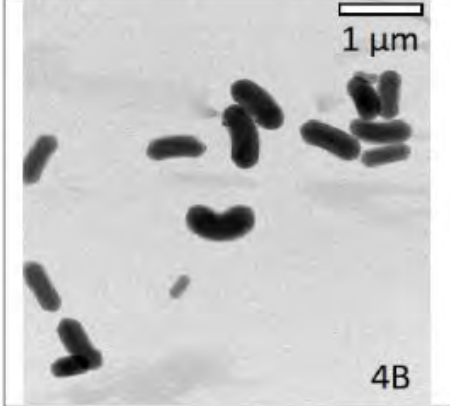
200 nm



1 μm

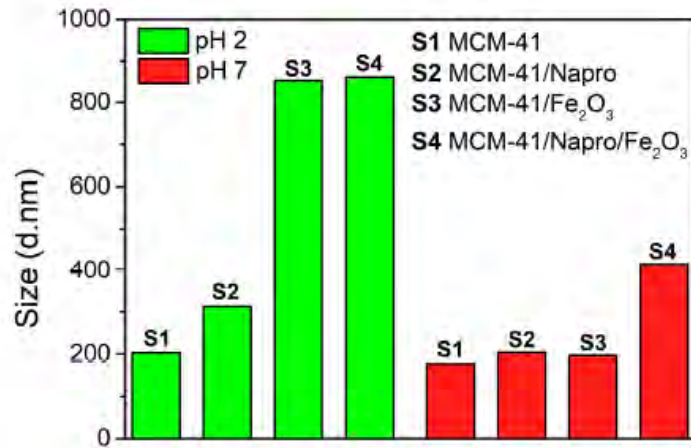


1 μm

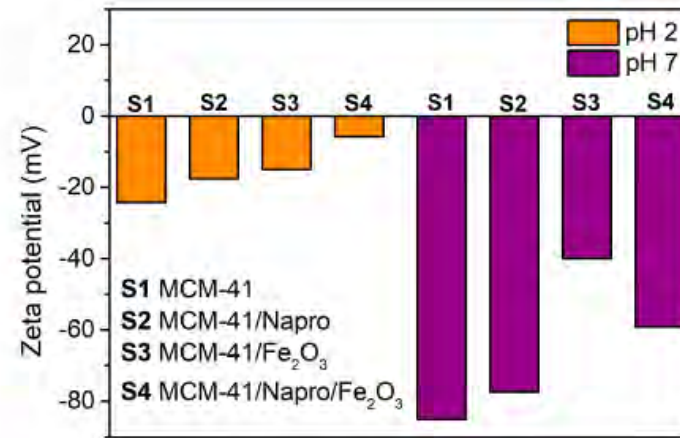




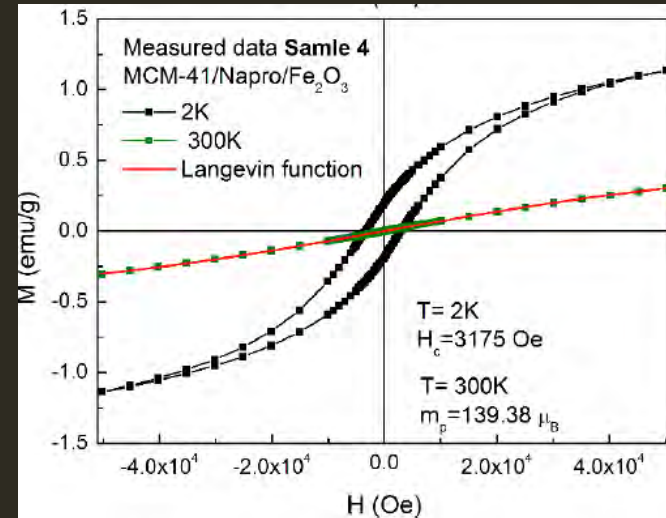
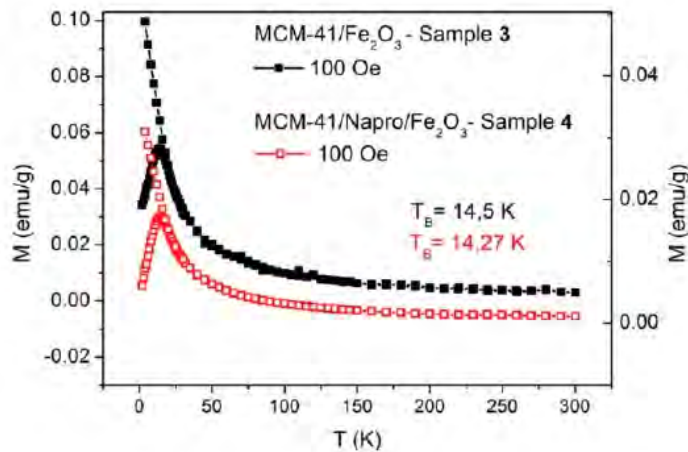
ŠTÚDIUM CYTOTOXICITY: DOTERAJŠIE MOŽNOSTI



(a)

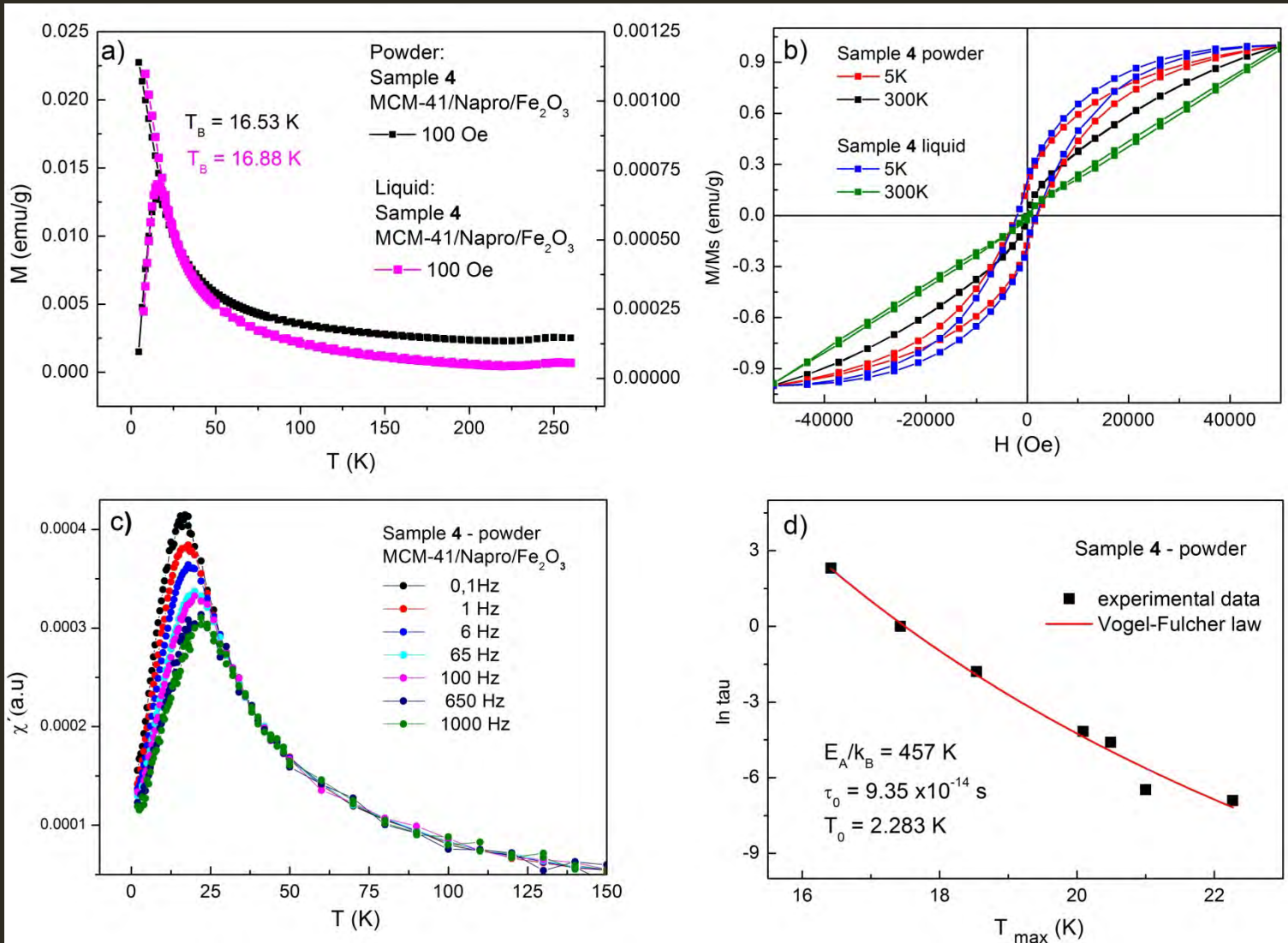


(b)





ŠTÚDIUM CYTOTOXICITY: DOTERAJŠIE MOŽNOSTI





ŠTÚDIUM CYTOTOXICITY: DOTERAJŠIE MOŽNOSTI

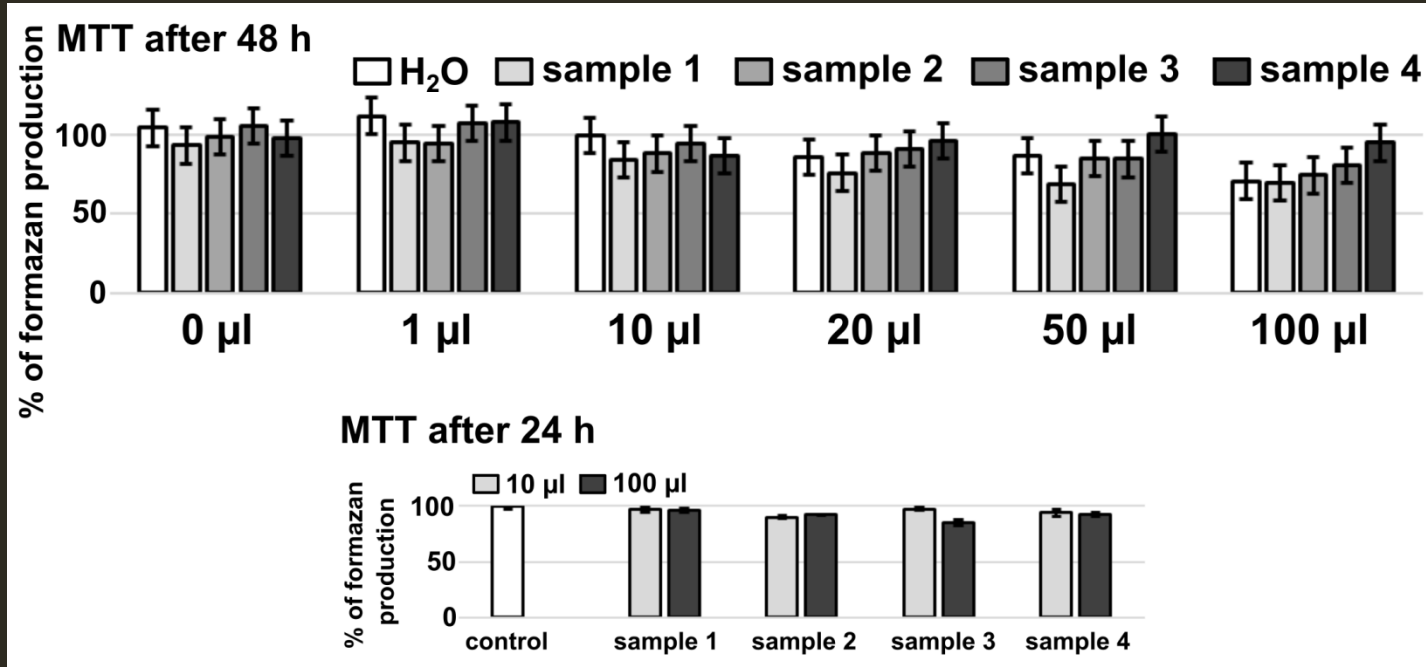


Figure 8. Production of formazan (cell metabolic activity related to the viability of cells) in U87 MG cells in the absence and presence of (0–100) µL/mL of distilled water with samples 1–4. Substances were incubated with cells for 24 and 48 h.



ŠTÚDIUM CYTOTOXICITY: DOTERAJŠIE MOŽNOSTI

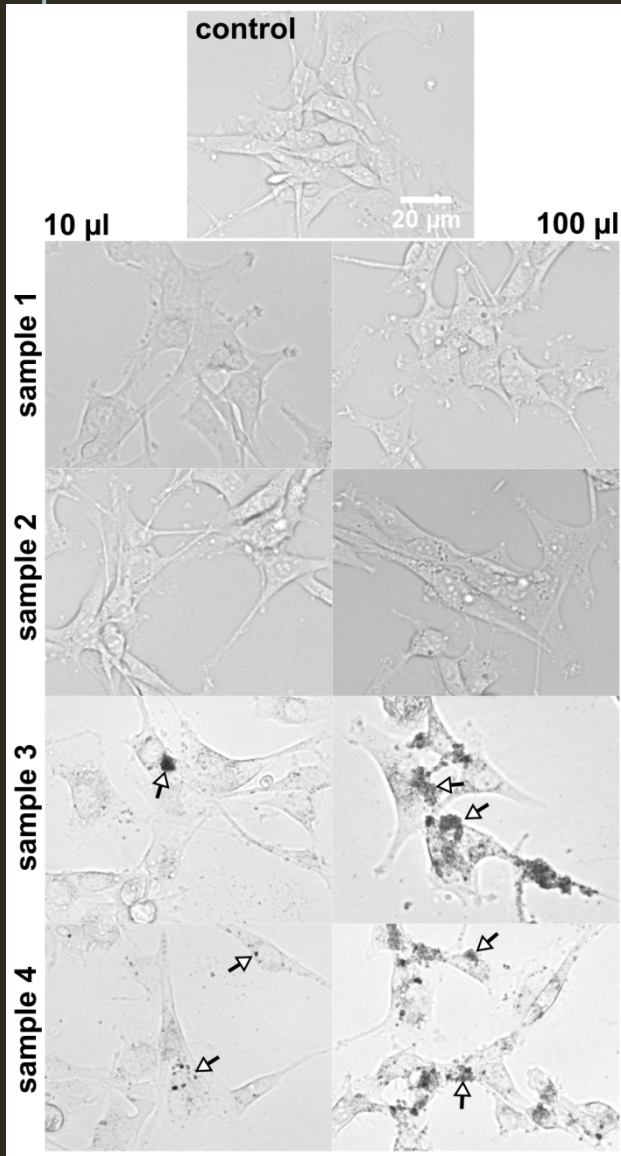


Figure 9. Bright-field images of U87 MG cells in the absence and presence of samples 1–4 at concentrations 10 and 100 $\mu\text{L}/\text{mL}$. Images were detected 24 h after substance administration. Arrows point to nanoparticle aggregates at 10 $\mu\text{L}/\text{mL}$ concentrations. The clusters of nanoparticles were adsorbed to the cell surface at 100 $\mu\text{L}/\text{mL}$.



ŠTÚDIUM CYTOTOXICITY: DOTERAJŠIE MOŽNOSTI

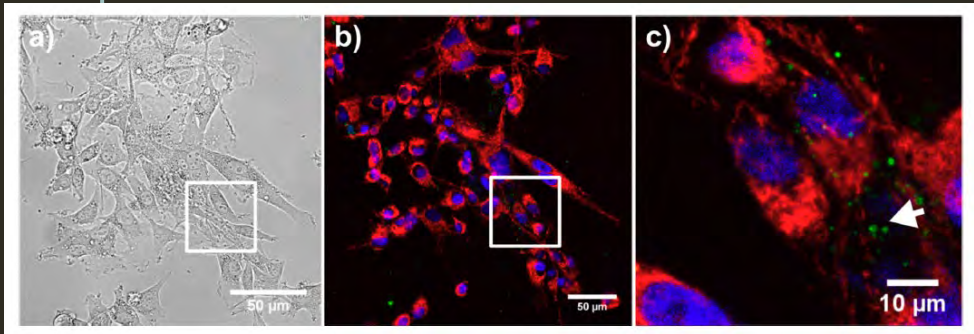
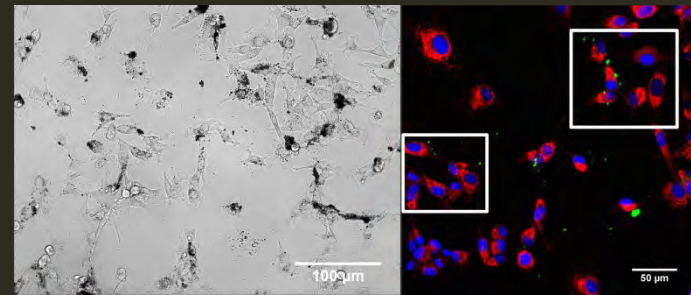


Figure 10. Bright-field (a) and fluorescence images (b,c) of U87 MG cells in the presence of 100 $\mu\text{L}/\text{mL}$ of sample 2. White square selection of the fluorescence image (b) was zoomed in (c). The white arrow points to externalized phosphatidylserine



2. Bright-field (a,d,f) and MTO (red), AnnexinV/FITC (green), and Hoechst (blue) fluorescence (b,c,e) images of cells in the presence of 100 $\mu\text{L}/\text{mL}$ of sample 4. White square selections of the fluorescence image (b) were zoomed

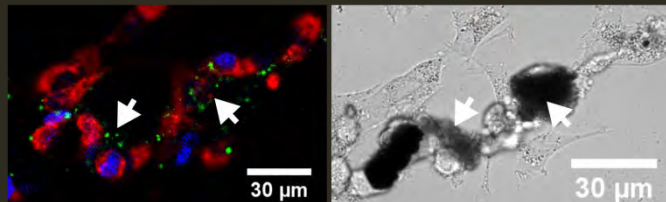
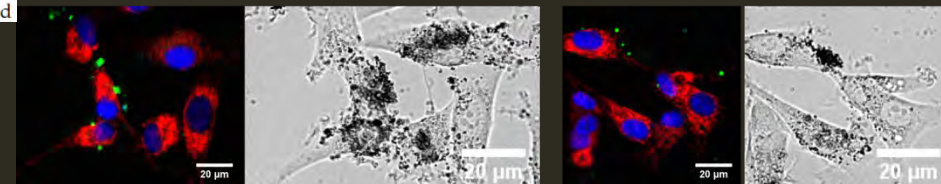
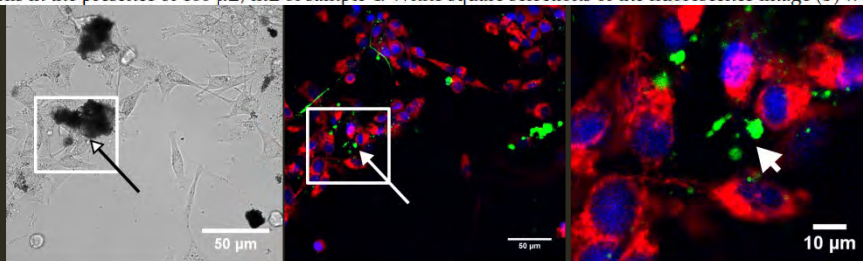
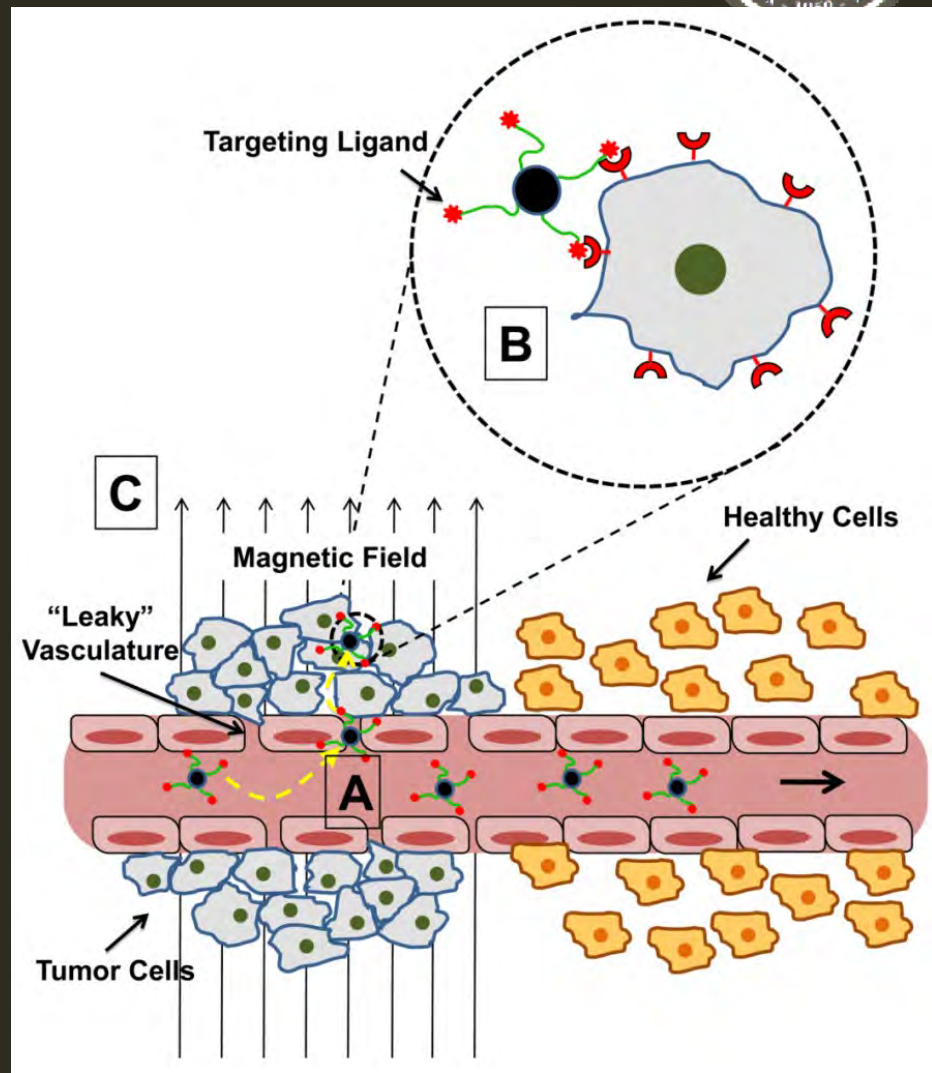
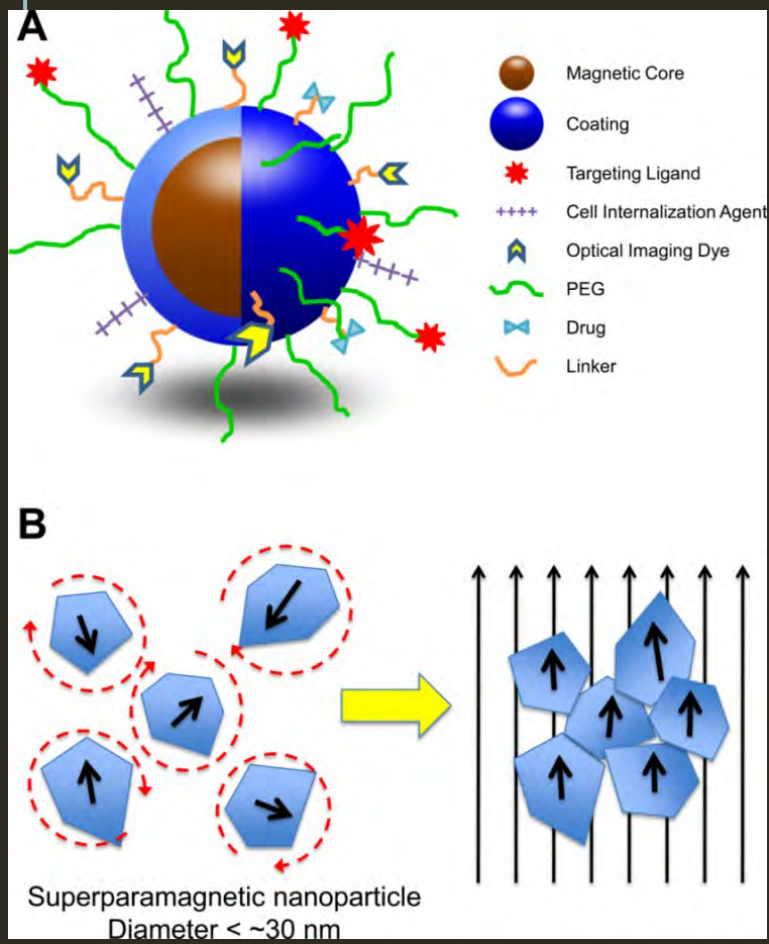


Figure 11. Bright-field (a,e) and MTO (red), AnnexinV/FITC (green), and Hoechst (blue) fluorescence (b-d) images of U87 MG cells in the presence of 100 $\mu\text{L}/\text{mL}$ of sample 3. White square selection of the fluorescence image (b) was zoomed in



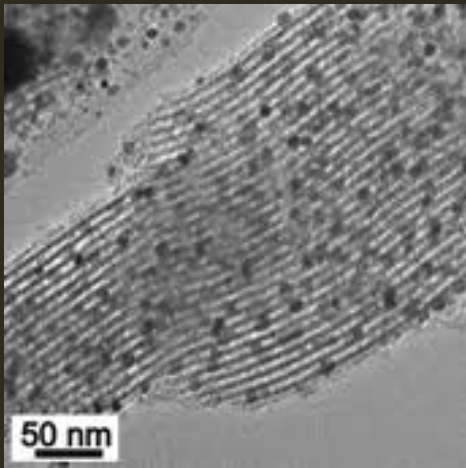
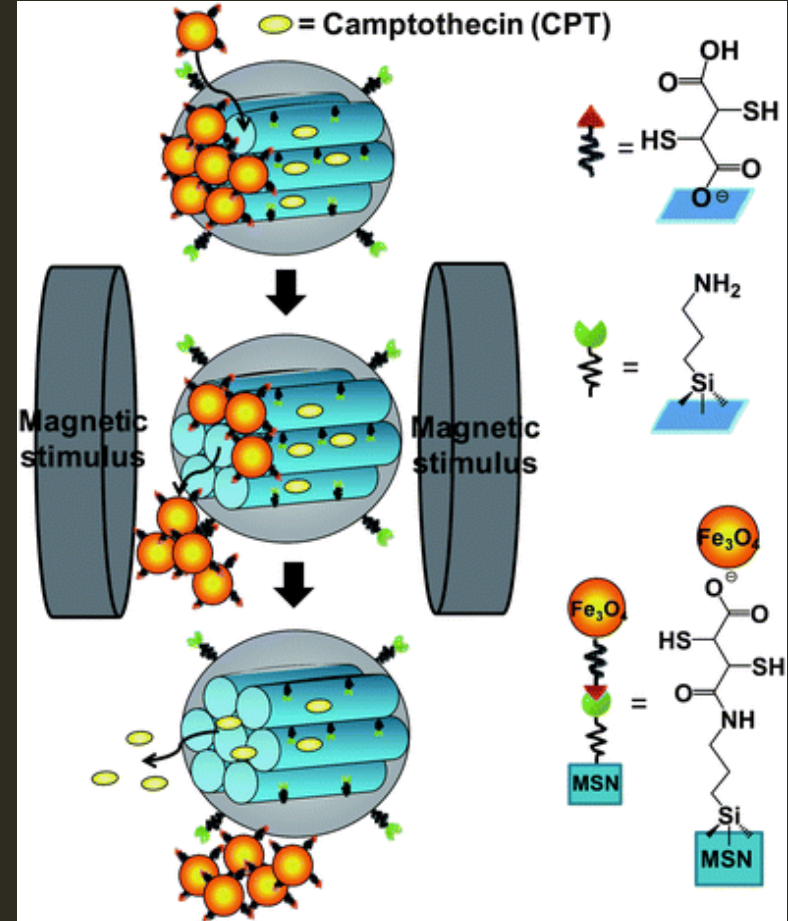
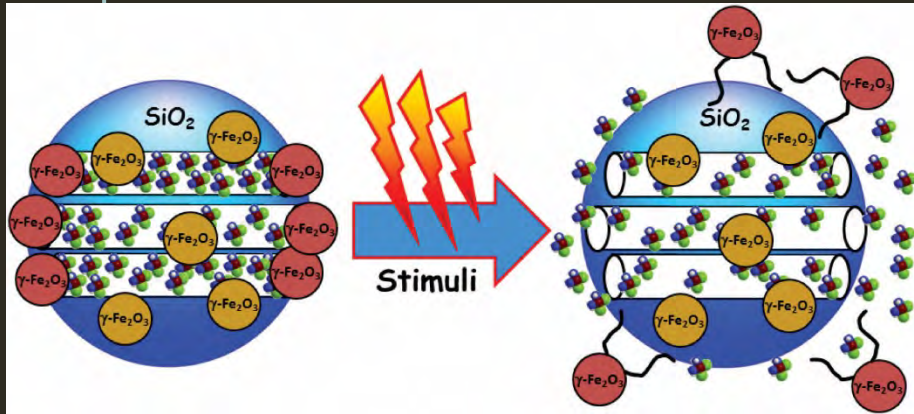
NANO SMART PRE CIELENÚ DODÁVKU LIEČIVA



A. J. Cole, Trends in Biotechnology 29 (2011) 323.



NANO SMART PRE CIELENÚ DODÁVKU LIEČIVA



M. Vallet-Regi, Biomater. Sci., 1 (2013) 114.

NANO SMART PRE CIELENÚ DODÁVKU LIEČIVA

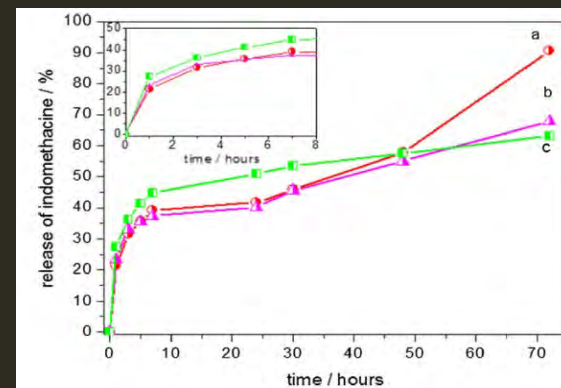
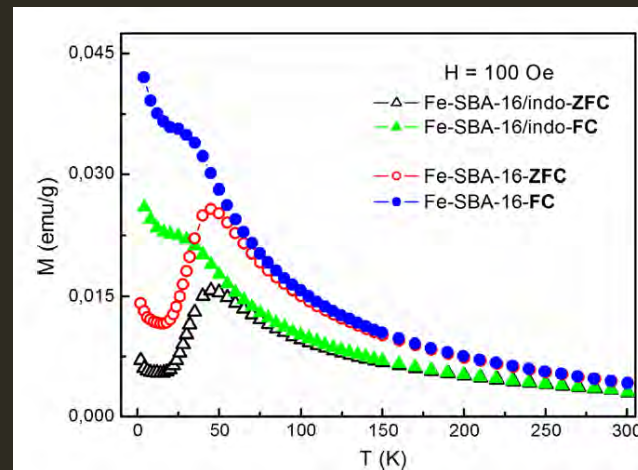
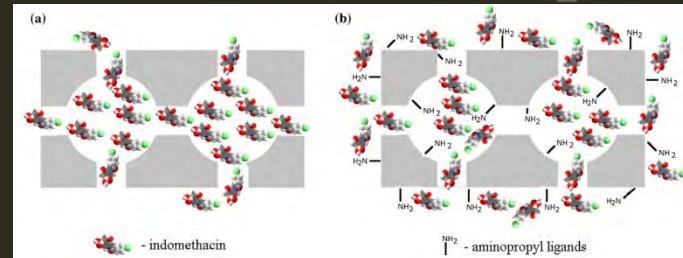
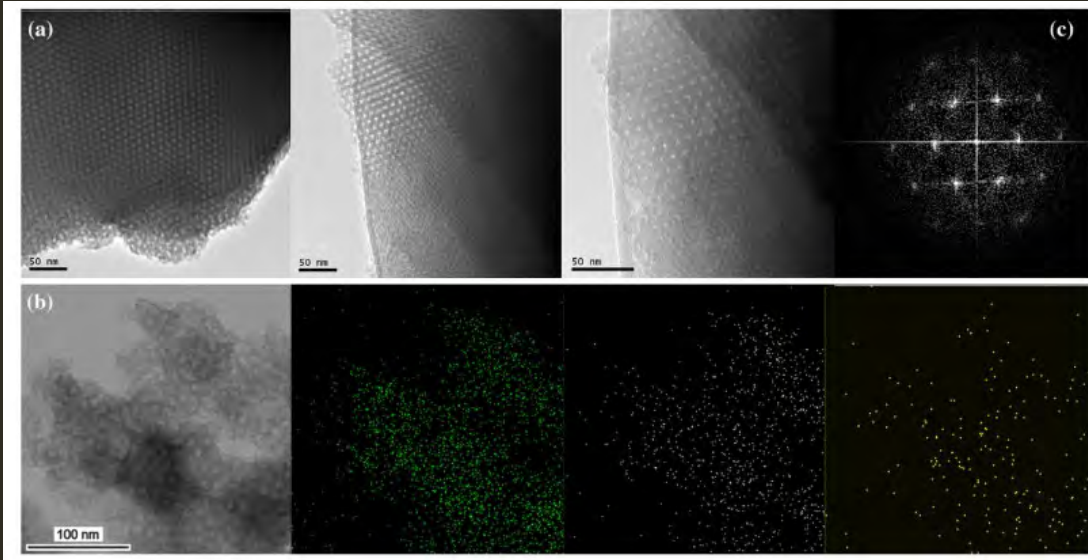


J Porous Mater
DOI 10.1007/s10934-016-0224-x



Periodic 3D nanoporous silica modified by amine or SPION nanoparticles as NSAID delivery system

Vladimír Zelenák¹ · Dáša Halamová¹ · Adriána Zelenáková² · Vladimír Girman²



V. Zelenak, et al., *Ordered cubic nanoporous silica support MCM-48 for delivery of poorly soluble drug indomethacin*, Applied Surface Science 2018

V. Zelenak, *A drug delivery system based on switchable photo-controlled p-coumaric acid derivatives anchored on mesoporous silica*, Journal of Materials Chemistry B, 2018.



Superparamagnetismus SPM

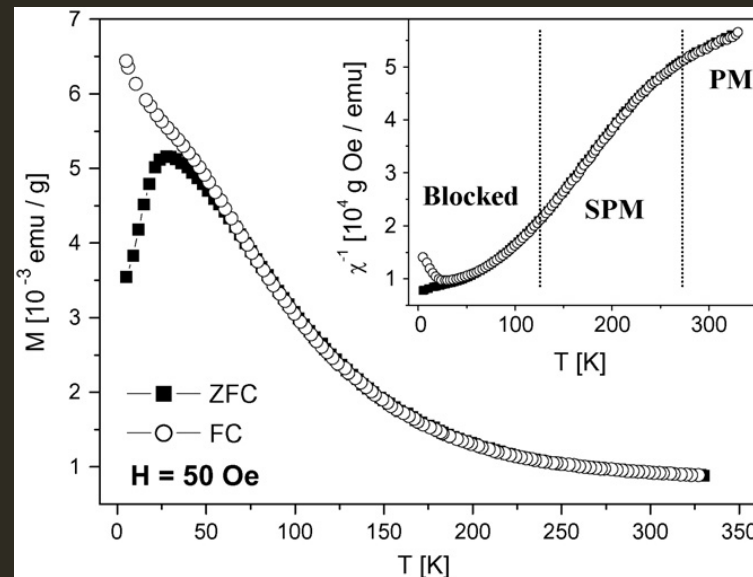
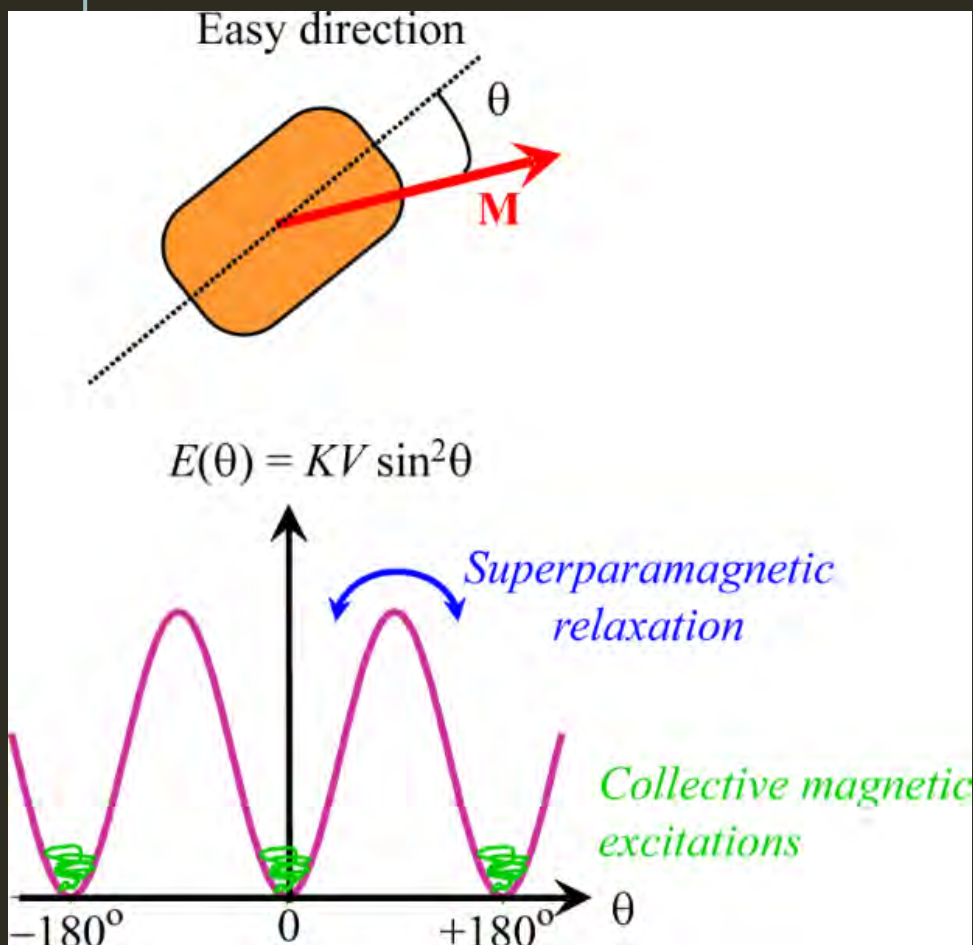


Stoner, Wohlfarth 1948, L. Néel 1949, W. F. Brown 1963

Thermally activated relaxation process typical for SPM,
 E_A energy barrier for macrospin reversal

$$\tau = \tau_0 \exp\left(\frac{E_a}{k_B T}\right)$$

Néel-Arrhenius model



S. Bedanta, et al., J. Phys. D: Appl. Phys. 42 (2010)