SEMINARIUM Z MAGNETYZMU I NADPRZEWODNICTWA

Uprzejmie zawiadamiamy, że w **środę**

26 października 2022 r., o godz.10:00

odbędzie się seminarium **on-line (link podany jest na stronie IF PAN)**,

na którym

dr Sabina Lewińska

(Instytut Fizyki PAN)

wygłosi referat na temat:

"Badania właściwości magnetycznych nanoferrytów $NiFe_2O_4$ i $NiFe_2O_4$ pokrytych SiO_2 oraz f-MWCNTs"

In the first part of my lecture, the comparison between $NiFe_2O_4$ and $NiFe_2O_4$ ferrite nanoparticles covered with SiO_2 in their as-received and annealed form will be presented. As it will be shown, all physicochemical parameters in the studied samples can be tuned by the heat treatment at 1000 °C, enhancing the crystallization process. In all studied materials, the presence of the $NiFe_2O_4$ inverse spinel ferrite structure with A-tetrahedral and B octahedral iron occupancy was confirmed. For the as-received $NiFe_2O_4$ sample, where collective freezing is observed, the superparamagnetic behavior at room temperature is confirmed by zero coercivity and Mössbauer spectra. In the case of the $NiFe_2O_4$@SiO_2 composite, the superparamagnetic behavior is preferably supported by the silica shell. The separation of the rhombohedral hematite α-Fe_2O_3 phase in the $NiFe_2O_4$ ferrite evidenced during the annealing process is demonstrated in structural and magnetic studies. Also, the room temperature superparamagnetic state observed for this sample is modified by annealing as an effect of ferrite crystallization and grain growth as well as hematite separation. Whereas the microstructure of the $NiFe_2O_4$@SiO_2 sample is varied during heating from core-shell to thin flake particles, where the latter are in the size of hundreds of nanometers and mainly composted of the crystalized silica matrix. In addition, I will discuss the results of the high temperature magnetization measurements, in which a phase transition was recorded, most probably related to nickel ferrite.

During the second part of my talk, I will concentrate on commercial f-MWCNTs (functionalized multiwalled carbon nanotubes) functionalized by the $COONH_4$ group. The detailed studies performed on nanotubes are extremely important for the further synthesis of composite materials based on f-MWCNTs. In this context, the multi-technic analysis of f-MWCNTs was performed. The structural and magnetic studies on commercial f-MWCNTs revealed the presence of γ-Fe nanoparticles, Fe_3C, and α-FeOOH as catalyst residues. Additionally, XRD analysis confirmed the presence of various nitrogen-based functional groups due to the purification and functionalization process of the nanotubes. Magnetic studies confirmed a significant contribution of Fe_3C as evidenced by a Curie temperature estimated at T_C ~ 452 K. The annealing procedure leads to a structural modification mainly associated with removing surface impurities as purification residues, and induced only slight changes in magnetic properties.

The lecture will be given in Polish.

Serdecznie zapraszamy

Roman Puźniak
Andrzej Szewczyk
Henryk Szymczak