P-06

Phase transitions in double metal cyanide catalysts

E. Dynowska[1*], A. Chrusciel[2], K. Lawniczak-Jablonska[1], I.N. Demchenko[1], J. Janik[2], and B. Sacher-Majewska[3]

[1]*Institute of Physics, Polish Academy of Sciences, al. Lotników 32/46, PL-02668 Warszawa, Poland*
[3] *Scientific Consortium ADVANCE DMC, MEXEO Kędzierzyn-Koźle, Poland*
[3] *Opole University, Dept. of Chemistry, Poland*

Keywords: catalysts, x-ray diffraction, thermogravimetry, differential scanning calorimetry
*e-mail: dynow@ifpan.edu.pl

Double metal cyanide (DMC) catalysts, obtained on the basis of zinc hexacyanocobaltate (III) ($Zn_3[Co(CN)_6]_2 \cdot nH_2O$), are used in industrial processes of polyaddition of oxiranes. These catalysts are obtained by introduction non-stoichiometric quantities of selected ligands into the $Zn_3[Co(CN)_6]_2 \cdot nH_2O$ structure.

Depending on the type of ligands and their connection procedure the catalysts exhibit different levels of activity.

The key problem is to find a mechanism justifying the catalytic properties of this group of catalysts.

For this purpose the X-ray diffraction (XRD) measurements in combination with thermo-analytical studies: thermogravimetry (TG) and differential scanning calorimetry (DSC) were undertaken.

The thermoanalytical studies allowed the observation of the effects associated with the water evaporation and the effects characteristic for dissociation of ligands bonding in the catalyst, occurring for temperatures significantly above the boiling point of these ligands.

A series of XRD measurements for the samples of hydrated zinc hexacyanocobaltate (III) and catalysts were carried out after their annealing in the characteristic temperatures indicated by thermoanalytical studies.

The results confirmed the relationship between the mass loss and the structural transformation. In the hydrated zinc hexacyanocobaltate (III) the mass loss is mostly attributed to the evaporation of water, in particular the removal of water molecules from the cubic structure of $Zn_3[Co(CN)_6]_2 \cdot nH_2O$, resulting in the appearance of rhombohedral phase of $Zn_3[Co(CN)_6]_2$.

In the catalysts, after different annealing processes, the unidentified transition phases have been observed. Annealing at the sufficiently high temperatures (above 280°C) led to transformation into the rhombohedral phase.

Acknowledgements: Research funded in part by the Project Innotech K2/IN2/21/181982/NCBR/12 (K-DMC). Jaroslaw Janik is a Fellow of the project "*PhD Scholarships – an investment in faculty Opole province*" co-financed by the European Union under the European Social Fund.

P-07

Magnetic behavior of non-interacting iron oxide nanoparticles in physiological solution

S. Haracz[1], J. Rybka[1], M. Hilgendorff[2], and M. Giersig[2]

[1]*Faculty of Chemistry, Adam Mickiewicz University, Umultowska 89 B, 61-614 Poznań, Poland*
[2]*Fachbereich Physik, FreieUniversität Berlin, Arnimalle 14, 14195 Berlin, Germany*

Keywords: magnetic nanoparticles, Raman spectroscopy

*e-mail: sylwiahr@amu.edu.pl

Magnetic proerties of nanoparticles depends on various parameters, such as size, shape, condition of synthesis or organic ligands on the surface. Here we present magnetic characteristics of non-interacting, highly crystalline iron oxide nanoparticles coated with modified polyacrylic acid [1-4]. The analysis comprised both static and dynamic magnetic behavior of magnetic nanoparticles in physiological solution.

Acknowledgments: This work was supported by UMO-2012/06/A/ST4/00373 grant from National Science Centre (Poland).

References

[1] N. Insin, *Surface Modifications of Iron Oxide Nanoparticles for Biological Applications*, PhD thesis, (MIT, Boston 2011).

[2] Y. Kim, W. Kim, H. Yoo, S. Koo Shin, *Bioconjugate Chem*. **21** (2012) 1305.

[3] R.H. Kodama, *J. Magn. Magn. Mater.* **200** (1999) 359.

[4] G.F. Goya, T.S. Berquó, F.C. Fonseca, *J. Appl. Phys.* **94** (2003) 3520.