Ondřej Kaman

Academic degrees: Ing., Mgr., Ph.D.

Position at the Institute of Physics, CAS: Head of the Laboratory of Synthetic Nanomaterials

Recent research activities and scientific interests:

- Synthesis of nanomaterials, especially magnetic nanomaterials, ranging from single-phase nanoparticles to core-shell particles, to complex nanosystems (synthesis of nanoparticles: thermal decomposition, solvothermal and hydrothermal syntheses, synthesis in flux, seed-and-growth methods; diverse procedures for surface modification including layer-by-layer self-assembly technique and covalent organic functionalization).
- Synthesis of coordination compounds (3d-metal complexes with redox-active ligands and bulky cyclopentadienyl ligands) and auxiliary organic synthesis (redox-active ligands; silanes and thiols for covalent functionalization of silica and gold; molecular sensors for recognition of inorganic ions). Isolation of and experimental work with highly sensitive compounds (complexes with exotic oxidation states) under inert conditions.
- DC and AC magnetic properties: measurements by SQUID magnetometer and PPMS, analysis and interpretation of magnetic data (experience with bulk, nanostructured and molecular systems).
- Powder diffraction studies and Rietveld method: X-ray and neutron diffraction for phase analysis, refinement of crystal structures, profile analysis, and analysis of magnetic ordering.
- Structural studies of nanomaterials by means of transmission electron microscopy including EDX.
- Applications of magnetic nanoparticles in medicine (analysis of transverse relaxivities in dependence of field and temperature, optimization of non-linear relaxation characteristics for magnetic particle imaging, advanced heating agents for magnetic fluid hyperthermia, controlled release of drugs triggered by external stimuli).
- Development of sensoric platforms based on gold nanostructures and chemical sensors for sensing of ions and local physiological conditions by surface-enhanced Raman spectroscopy.
- Development of magneto-electric nanoparticles for medical applications.

International collaboration:

- Technische Universität Kaiserslautern (Prof. H. Sitzmann) – synthesis and magnetic studies of coordination compounds with redox-active ligands and bulky alkylcyclopentadienyl ligands
- Technische Universität Darmstadt (Dr. I. Dirba and Prof. A. Weidenkaff) – magnetic nanoparticles and nanostructuring
- Universitätsklinikum Freiburg (Prof. U. Hoffmann) – magneto-electric nanoparticles and magnetic particle imaging
- Institut de Chimie de la Matière Condensée de Bordeaux, CNRS (Prof. G. Goglio and Prof. E. Duguet) – magnetic nanoparticles and nanomaterials for medical applications and magnetotransport studies
- Joint Institute of Nuclear Research in Dubna (Dr. D. Kozlenko) – neutron diffraction including high-pressure experiments – this long-term cooperation was abandoned in 2022 due to the war of Russia against Ukraine
- Arbuzov Institute of Organic and Physical Chemistry (Dr. R. Zairov and Dr. V. Khrizanforova) – unusual magnetic colloids and complexes with redox-active ligands – this recently very active cooperation was abandoned in 2022 due to the war of Russia against Ukraine

Supervision of students and postdocs:

- supervision of 1 and co-supervision of 2 MSc students
- co-supervision of 3 PhD students
- supervision of 3 postdoc researchers from abroad

Projects:

- PI/co-PI (i.e. responsible person for one of participating institutions) of 4 standard Czech Science Foundation (GACR) projects: *Composite nanoparticles with magnetically and light activated release of biologically active compounds* (2017-2019), *Oxide nanomagnets, their properties and interactions with*

biological systems (2016-2018), *Complex magnetic nanoparticles with monodisperse oxide cores and stable organic corona for biological research and biomedical applications* (2011-2014).

· PI of a Mobility Plus project (CAS and DAAD) in cooperation with Prof. H. Sitzmann from the TU Kaiserslautern: *Alkylcyclopentadienyl complexes of high-spin chromium(II) and iron(II) central ions and their oxidized analogues* (2022–2023).

· PI of a project of the Grant Agency of Charles University: *New proton conductors with supramolecular architecture and control of hydrogen bonds* (2008–2009).

Publication activities:

· Number of articles in journals with IF (document type: article/review on WoS): 84

· H-index (according to WoS): 20, Sum of the times cited (according to WoS): 1,567

· Patents: 2, Utility models: 1

Selected publications:

1. I. Smytschkow, W. Gidt, Y. Sun, J. Langer, T. Böttcher, L. Kubíčková, **O. Kaman**, and H. Sitzmann, Chromium(II) Alkylcyclopentadienyl Complexes with Carbon or Hydride Donor Ligands. *Organometallics* 40 (2021) 2951-2969.
2. **O. Kaman**, E. Pollert, P. Veverka, M. Veverka, E. Hadová, K. Knížek, M. Maryško, P. Kašpar, M. Klementová, V. Grunwaldová, S. Vasseur, R. Epherre, S. Mornet, G. Goglio, E. Duguet, Silica encapsulated manganese perovskite nanoparticles for magnetically induced hyperthermia without the risk of overheating, *Nanotechnology* 20 (2009) 275610.
3. M. Kačenka, **O. Kaman**, S. Kikerlová, B. Pavlů, Z. Jirák, D. Jirák, V. Herynek, J. Černý, F. Chaput, S. Laurent, I. Lukeš, Fluorescent magnetic nanoparticles for cell labeling: Flux synthesis of manganite particles and novel functionalization of silica shell, *Journal of Colloid and Interface Science* 447 (2015) 97-106.
4. M. Kačenka, **O. Kaman**, J. Kotek, L. Falteisek, J. Černý, D. Jirák, V. Herynek, K. Zacharovová, Z. Berková, P. Jendelová, J. Kupčík, E. Pollert, P. Veverka, I. Lukeš, Dual imaging probes for magnetic resonance imaging and fluorescence microscopy based on perovskite manganite nanoparticles, *Journal of Materials Chemistry* 21 (2011) 157-164.
5. P. Žvátora, M. Veverka, P. Veverka, K. Knížek, K. Závěta, E. Pollert, V. Král, G. Goglio, E. Duguet, **O. Kaman**, Influence of surface and finite size effects on the structural and magnetic properties of nanocrystalline lanthanum strontium perovskite manganites, *Journal of Solid State Chemistry* 204 (2013) 373-379.
6. **O. Kaman**, D. Kubániová, K. Knížek, L. Kubíčková, M. Klementová, J. Kohout, Z. Jirák, Structure and magnetic state of hydrothermally prepared Mn-Zn ferrite nanoparticles, *Journal of Alloys and Compounds* 888 (2021) 161471.
7. J. Koktan, K. Královec, R. Havelek, J. Kuličková, P. Řezanka, **O. Kaman**, Magnetic oxide particles with gold nanoshells: Synthesis, properties and cytotoxic effects, *Colloids and Surfaces A: Physicochemical and Engineering Aspects* 520 (2017) 922-932.
8. T. Bertok, L. Lorencova, S. Hroncekova, V. Gajdosova, E. Jane, M. Hires, P. Kasak, **O. Kaman**, R. Sokol, V. Bella, A.A. Eckstein, J. Mosnacek, A. Vikartovska, J. Tkac, Advanced impedimetric biosensor configuration and assay protocol for glycoprofiling of a prostate oncomarker using Au nanoshells with a magnetic core, *Biosensors and Bioelectronics* 131 (2019) 24-29.
9. L. Kubickova, **O. Kaman**, P. Veverka, V. Herynek, P. Brazda, K. Bernasek, M. Veverka, J. Kohout, Magnetic properties, Fe-57 Mossbauer spectroscopy and H-1 NMR relaxometry of epsilon-$Fe_{2-x}Ga_xO_3$ nanoparticles: The effect of gallium doping on magnetic and MRI performance, *Journal of Alloys and Compounds* 856 (2021) 158187.
10. L. Kubickova, **O. Kaman**, P. Veverka, V. Herynek, P. Brazda, M. Vosmanska, T. Kmjec, P. Dvorak, D. Kubaniova, J. Kohout, The epsilon-$Al_xFe_{2-x}O_3$ nanomagnets as MRI contrast agents: Factors influencing transverse relaxivity, *Colloids and Surfaces A-Physicochemical and Engineering Aspects*, 589 (2020) 124423.
11. D. Nuzhnyy, V. Bovtun, M. Savinov, M. Kempa, J. Petzelt, **O. Kaman**, M. Klementová, J. Kuličková, Z. Jirák, Synthesis and broadband dielectric-infrared spectroscopy of $La_{1-x}Sr_xMnO_3$@$BaTiO_3$ nanocomposite, *Materials Research Bulletin* 144 (2021) 111459.