Expanding possibilities for investigating of chemical composition with m-XRF spectrometer M4 TORNADO from Bruker. AXS

E.Onoprienko
OPTEC LLC, Ukraine

m-XRF spectrometer M4 TORNADO is a new standard in non-destructive elemental analysis. The use of the modern X-ray tubes and polycapillary X-ray optics provides generating high fluorescence intensities even of smallest sample areas. The X-ray optics allow to focus tube radiation from a large solid angle and concentrate it on spots down to 25 µm for Mo-K radiation, provide maximum intensity in spot. The M4 TORNADO is equipped with XFlash® silicon drift detector (SDD) technology (active detector area is 10 mm^2, the energy resolution down135 eV). High-precision optical system and the software provides obtaining qualitative and quantitative analysis in seconds, "on the fly". Analysis of any type samples (metals, alloys, powders, liquids including in homogeneous and irregular shaped specimens) is based on standard models and standard less calculation. These functional features allow to recommend M4 TORNADO spectrometer for applications in various fields of science, manufacturing, training: metallurgy, machine-building and instrument-making industries, geology, nanotechnology, etc.

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General Session IV

Colloidal Nanocrystal Architectures for Nanophotonics

N. Gaponik
Technical University of Dresden, Germany

Nowadays assembly approaches are recognized as being the main working tool of bottom up chemical nanotechnology. The assembly of strongly emitting semiconductor nanocrystals can be performed on flat, porous and spherical surfaces and thus are very important for thin-film technologies, doping of mesoporous materials, modification of pre-patterned substrates, the creation of microshells and cavities, etc. Self-assembly approaches or the use of removable templates make possible the formation of nanowires, nanosheets or nanoporous 3D ordered materials created solely from the assembled nanoparticles. Hierarchical assembling and assembling of nanocrystals with other organic or inorganic entities opens up the possibility to achieve composites with literally unlimited functionalities. The understanding and governing of charge and energy transfer processes between the components of the composites are the key points in their efficient utilization as building blocks in novel types of LEDs, photovoltaic and photonic devices and various optical sensors.

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Resonant energy transfer in the complexes of semiconductor nanocrystals and organic dye molecules

M. Artemyev
Institute for Physico-Chemical Problems of Belarussian State University, Belarus

Forster resonant energy transfer (FRET) within the luminescent donor-acceptor complexes is a powerful tool for biomedical fluorescent detection platforms, optical sensors. Luminescent semiconductor colloidal nanocrystals or quantum dots are ideal candidates for FRET donors due to very broad spectral range of optical absorption and narrow photoluminescence bands, whose spectral position can be easily tuned either by size or chemical composition of quantum dots. Additionally, the shape of semiconductor nanocrystals can be varied from spherical (quantum dots) to elongated (nanorods), nanowires, tetrapods. Based on the experimental results, here we discuss how to construct the efficient FRET complexes with luminescent CdSe nanocrystals, how the shape of CdSe nanocrystals may affect on the FRET efficiency in the nanocrystal-dye complexes, how to control with FRET the radiative and non-radiative pathways in double band-emitting ZnSe quantum dots doped with Mn ions.

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