



Optical properties of colloidal $\text{ReVO}_4:\text{Eu}^{3+}$ (Re=La, Gd, Y) nanophosphors

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Characteristics of activated nanocrystals

- **Narrow spectral bands**
- **The absence of blinking**
- **High photochemical stability**
- **Large Stokes' shift (more than 150 nm)**

Colloidal nanoluminophors of $\text{ReVO}_4 \cdot \text{Eu}^{3+}$ (Re = Y, Gd, La)

Under transmitted light



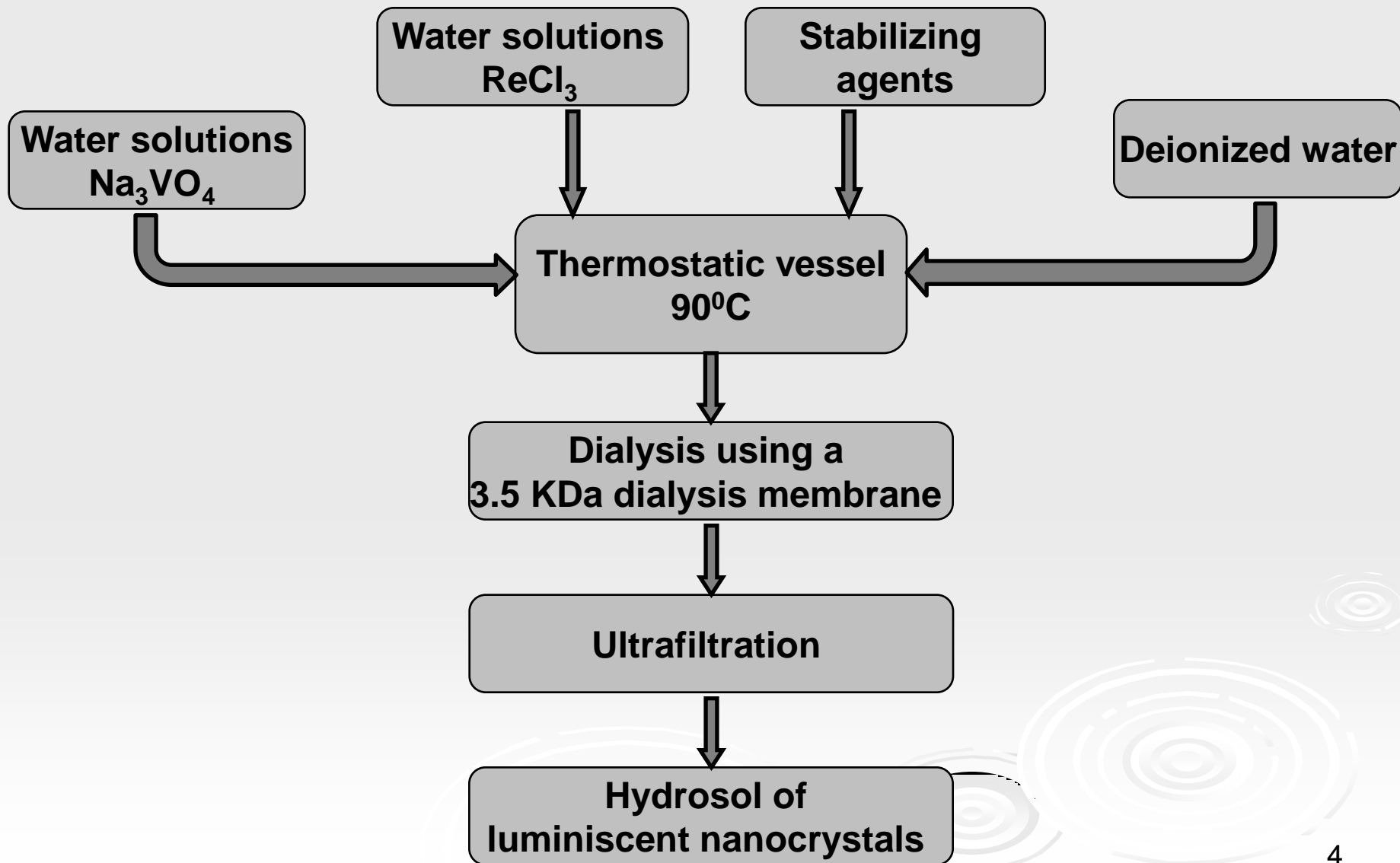
Under UV irradiation



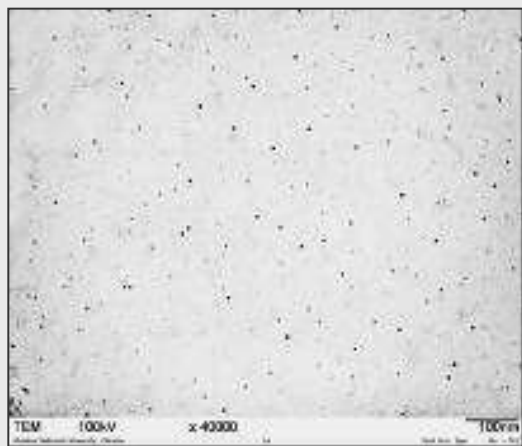
Water-soluble powders of orthovanadate nanocrystals

Wet-Chemical Synthesis of nanoluminophors

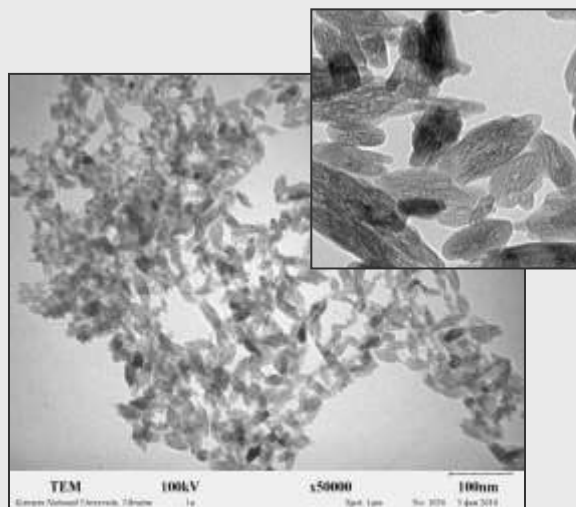
$\text{ReVO}_4 \cdot \text{Eu}^{3+}$ (Re = Y, Gd, La) colloidal solutions



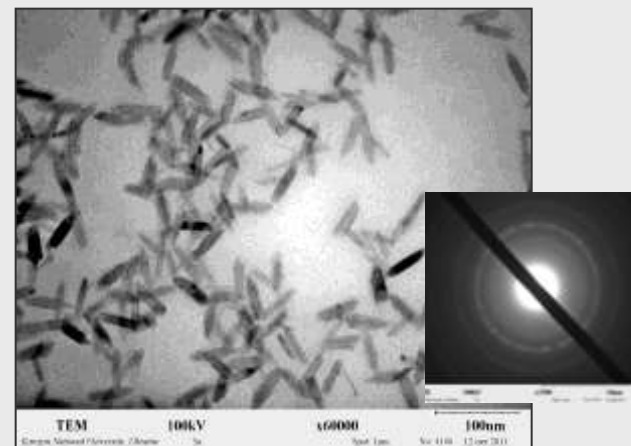
TEM images of $\text{ReVO}_4:\text{Eu}^{3+}$ nanocrystals in colloidal solutions



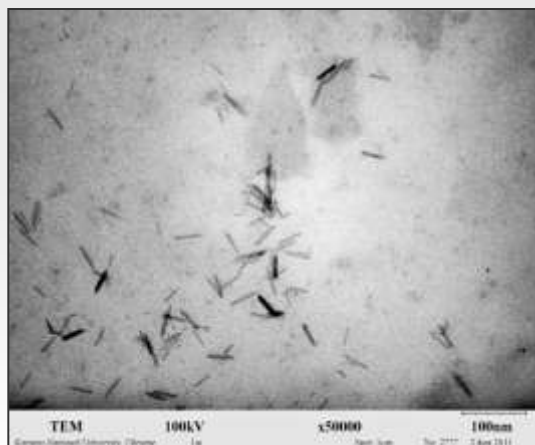
spherical particles ~ 2 nm



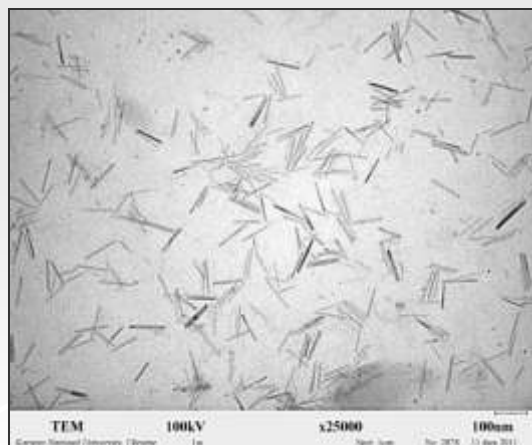
spindle-like ~ 3×10 nm



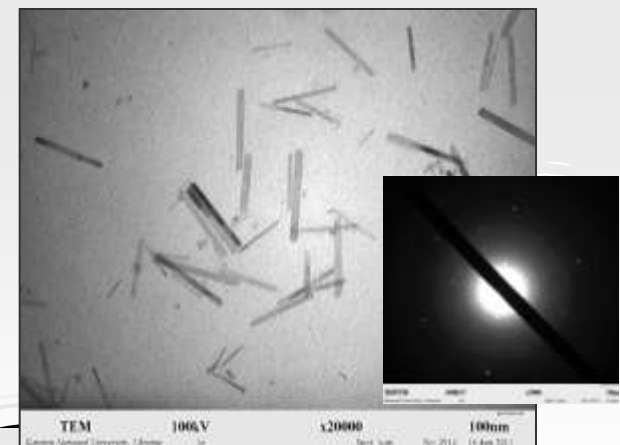
spindle-like ~ 10×50 nm



rod-like ~ 5×40 nm

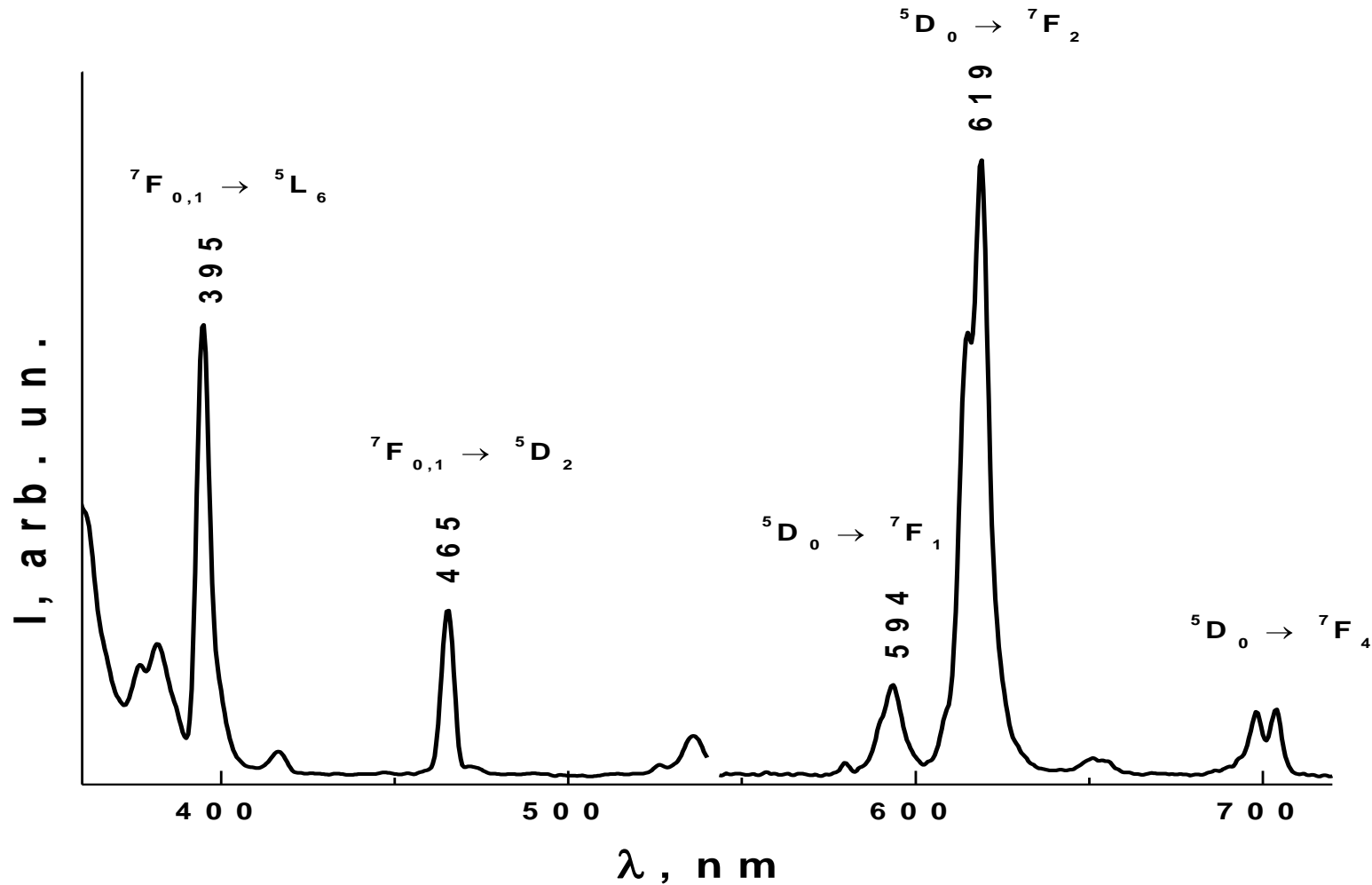


rod-like ~ 8×80 nm

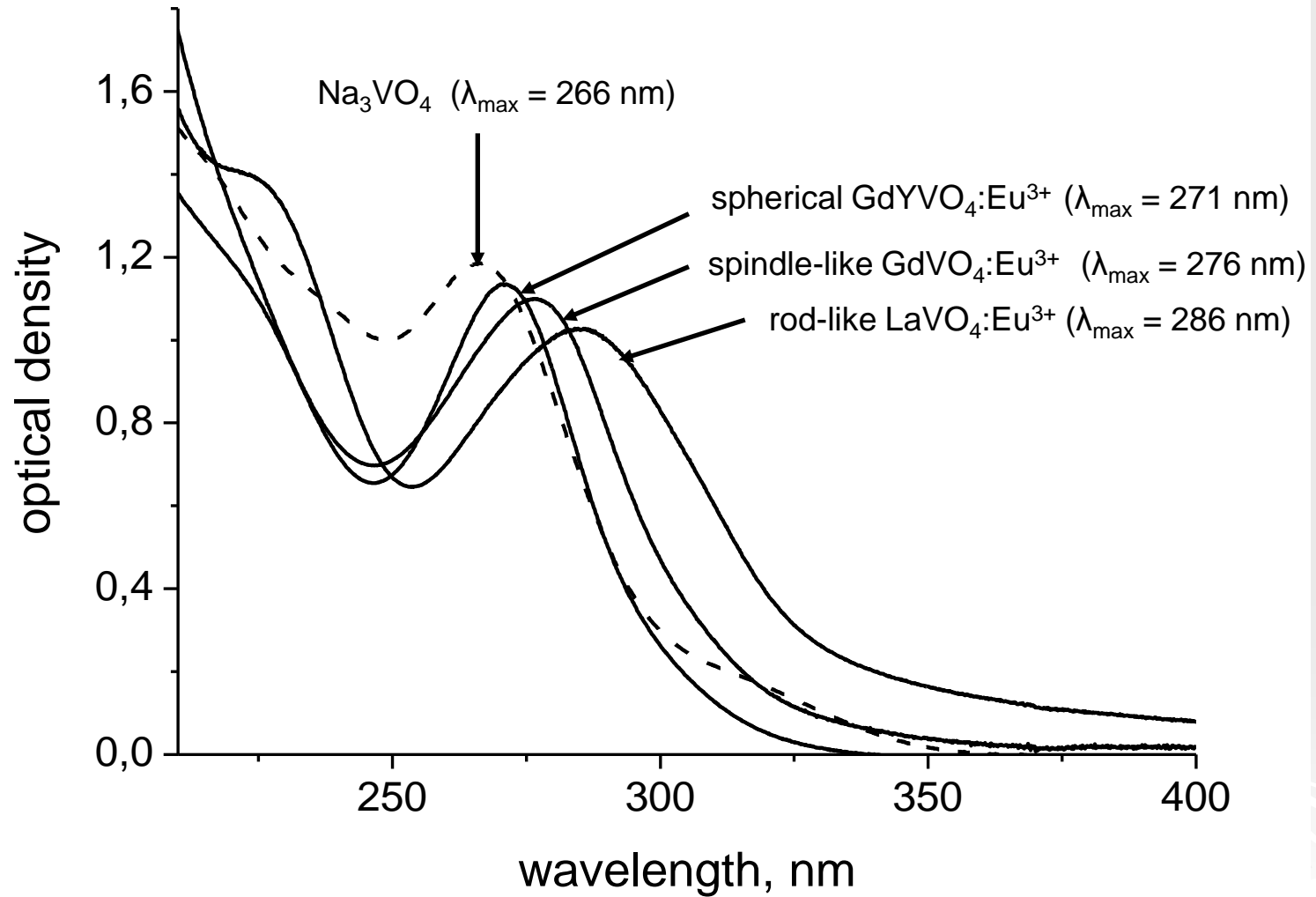


rod-like ~ 28×300 nm

Excitation (left, $\lambda_{vis}=619$ nm) and emission (right, $\lambda_{ex}=395$ nm) spectra of $\text{ReVO}_4:\text{Eu}^{3+}$ luminophor in water solution

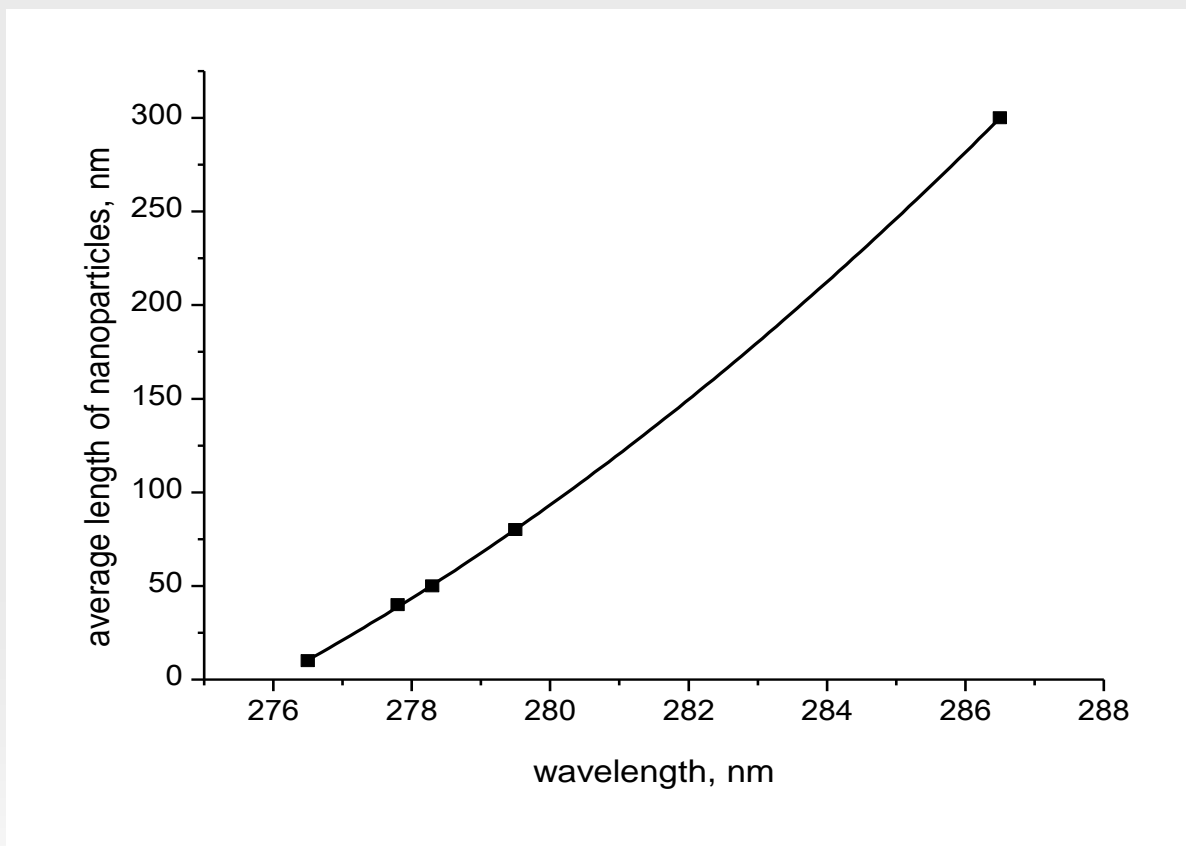


UV-vis absorption spectra of $\text{ReVO}_4:\text{Eu}^{3+}$ ($\text{Re} = \text{Y, Gd, La}$)



The dependence λ_{\max} of the absorption on the average length of nanoparticles

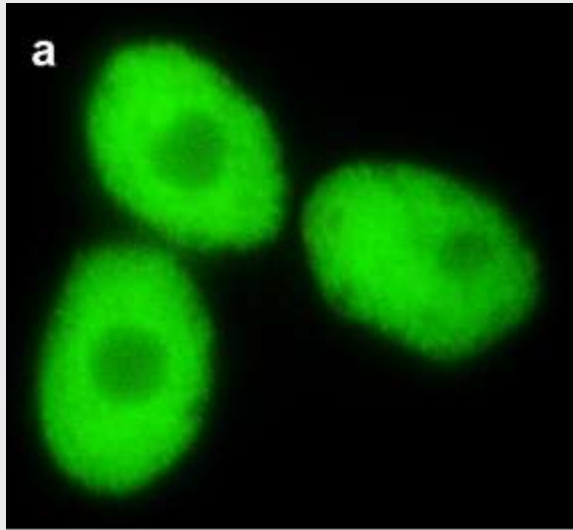
for nonspherical particles in the range of linear sizes of 10 - 300 nm



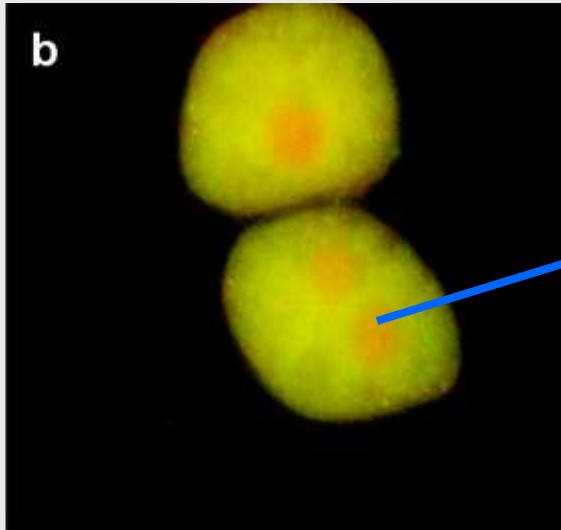
Increase of the size of nanoparticles leads to bathochromic shift of the absorption maximum

The application of $\text{ReVO}_4: \text{Eu}^{3+}$ (Re = Y, Gd, La) nanoluminophors colloidal solutions as luminescent probes

Luminescence microscopy images of hepatocytes and isolated cells



Autofluorescence of hepatocytes



Fluorescence of hepatocytes under incubation with NPs

The intensive luminescence of nanoparticles in the nuclei of hepatocytes is observed

- **cellular imaging to reveal the localization and movement of intracellular substances;**
- **drug delivery**

Conclusions

- $n\text{ReVO}_4:\text{Eu}^{3+}$ (Re = Gd, Y, Sm, La) luminescent nanocrystals with different shapes and sizes from 2 to 300 nm have been synthesized in the form of water colloidal solutions
- Luminescence of $n\text{ReVO}_4:\text{Eu}^{3+}$ nanocrystals are effectively excited under UV and visible irradiation
- It was found, that increase of the size of nanoparticles leads to bathochromic shift of the absorption maximum
- The Stokes shift for fluorescence nanocrystals $n\text{GdYVO}_4:\text{Eu}^{3+}$ more than 200 nm allows to separate the autofluorescence of biological material from the fluorescence of the probe
- Spherical $n\text{GdYVO}_4:\text{Eu}^{3+}$ nanocrystals are efficient inorganic markers

Thank you for attention!

