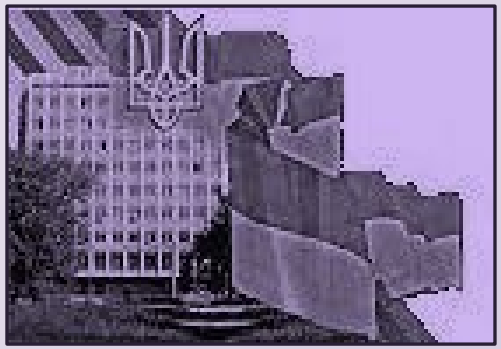


Institute for Information Recording of National Academy of Sciences of Ukraine

Shpaka str. 2, 03113, Kyiv, Ukraine
E-mail: kryuchyn@gmail.com

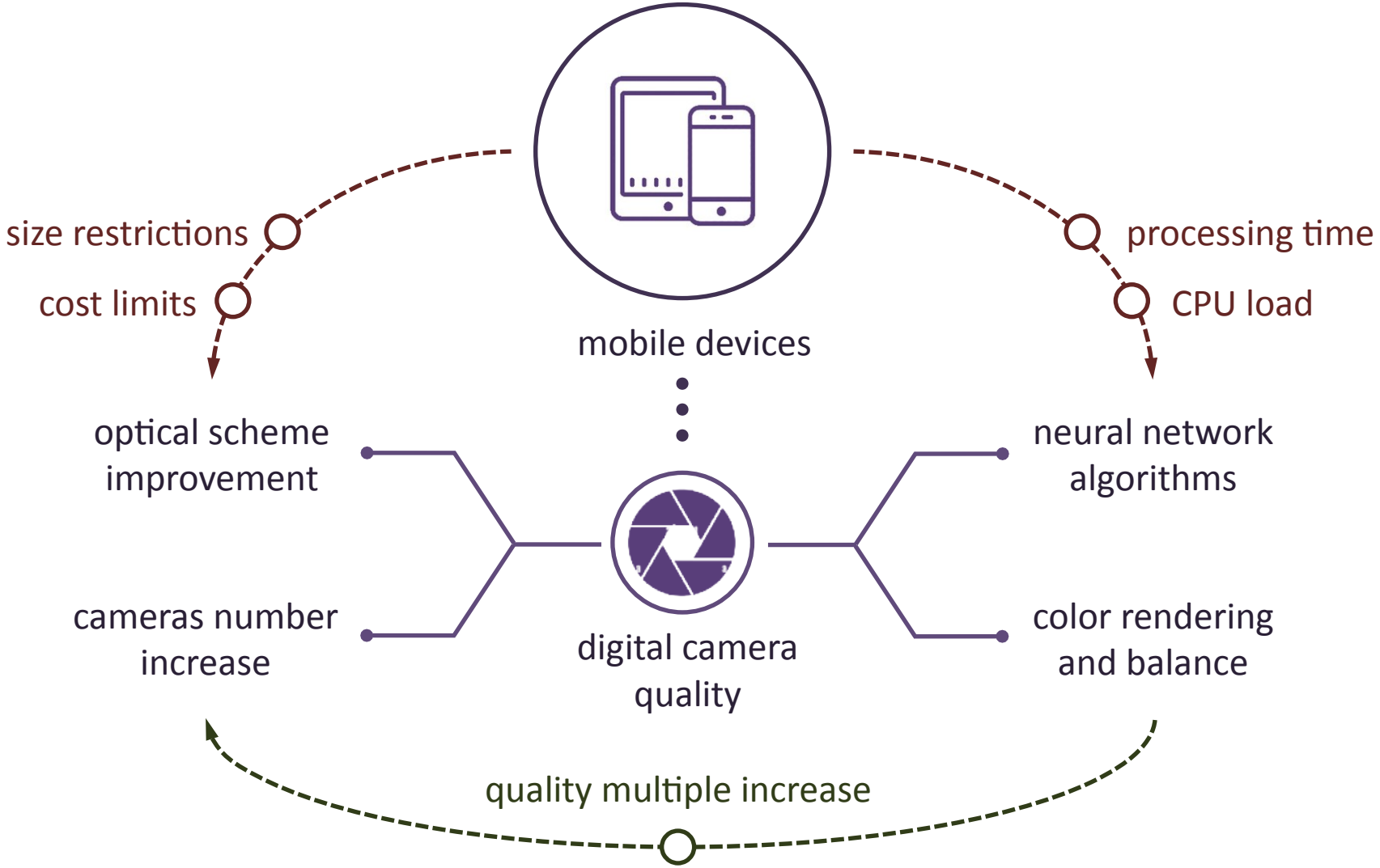
OPTIMIZATION OF PHOTOELECTRIC CONVERTERS

NANO-2022: Nanotechnology and Nanomaterials

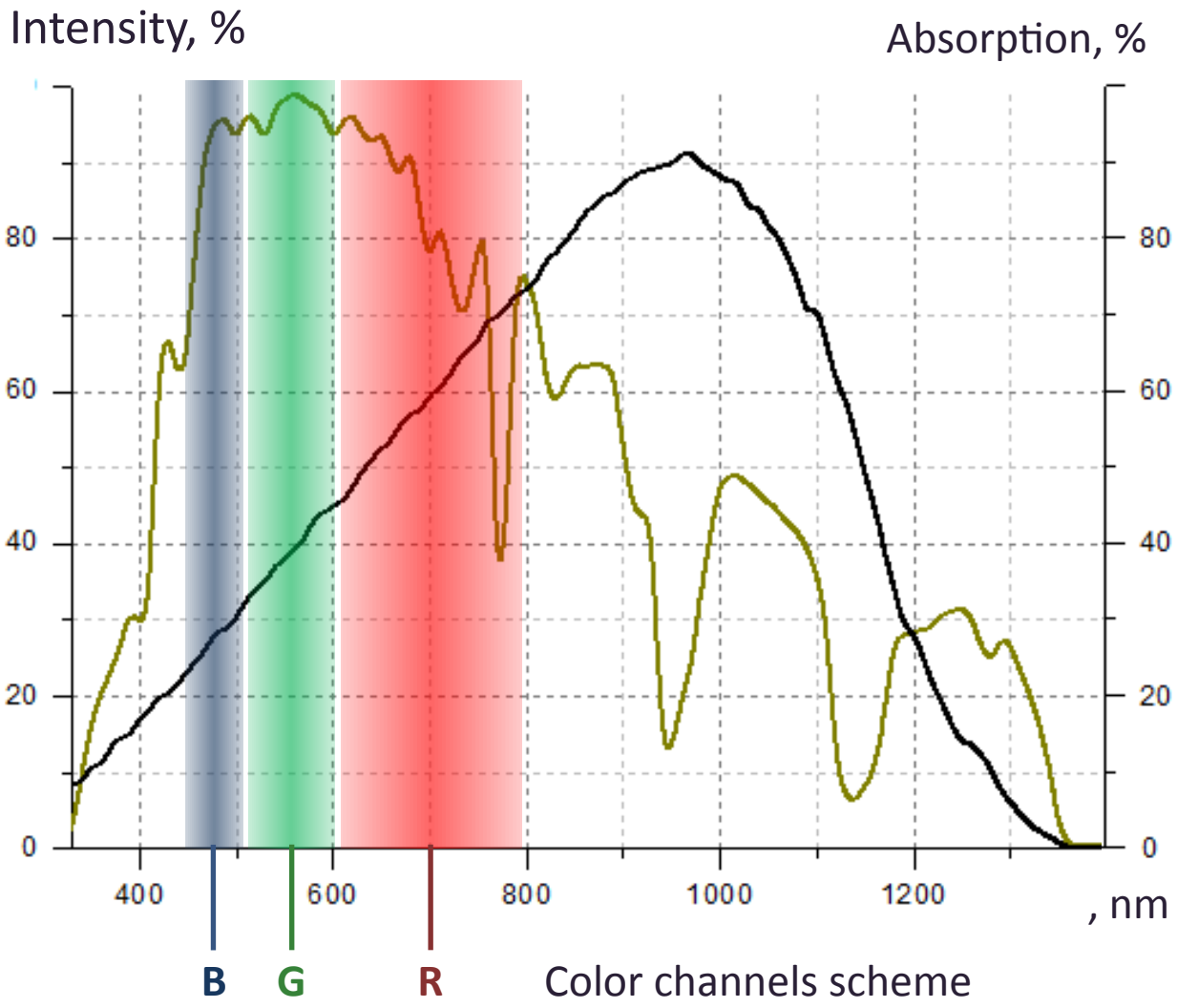
Beliak Ie.V., Kryuchyn A.A.
Manko D.Yu.

Kyiv-2022

2 Quality of digital photography: Basic approaches



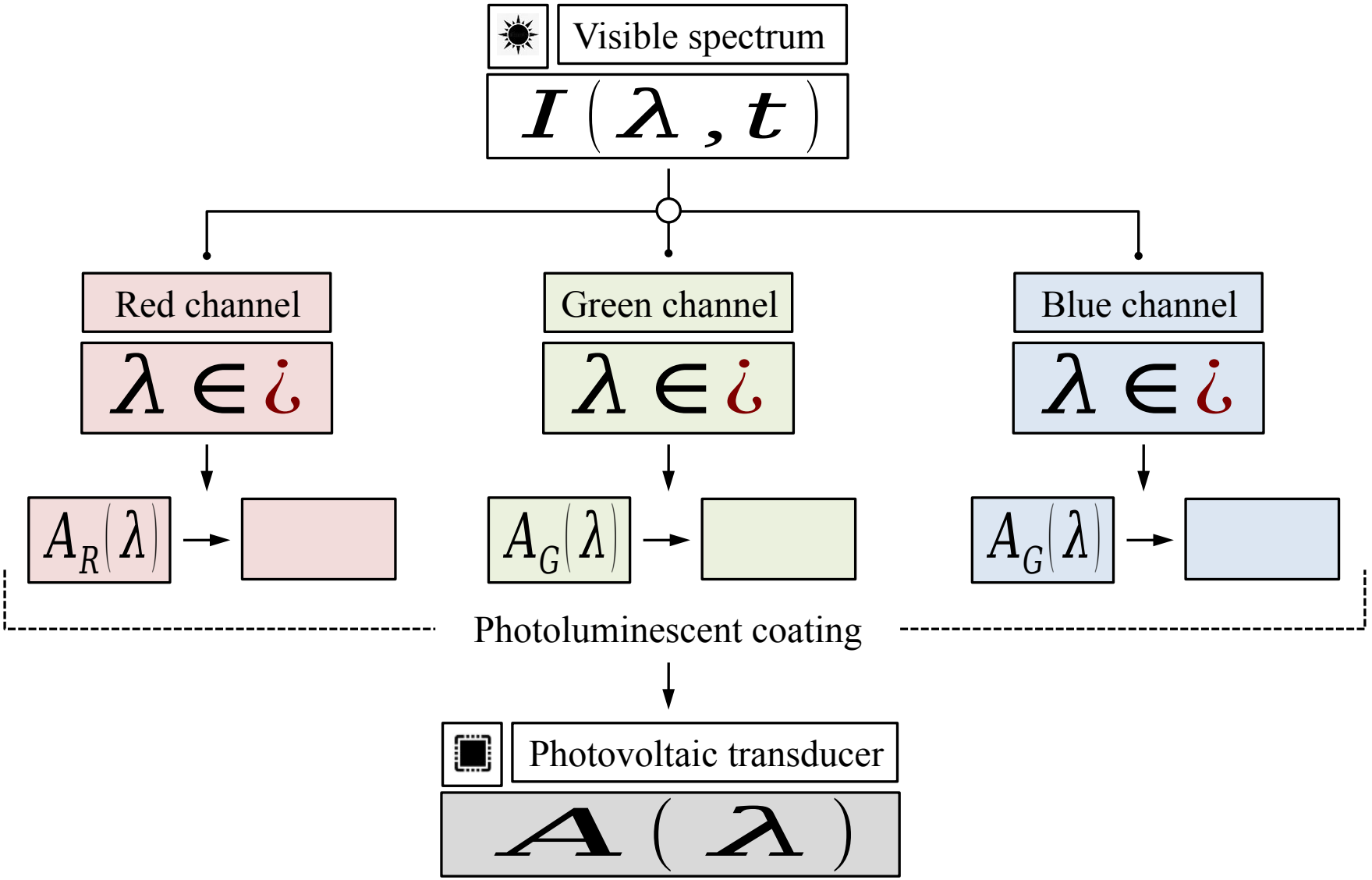
3 Photovoltaic system: Spectra mismatch problem



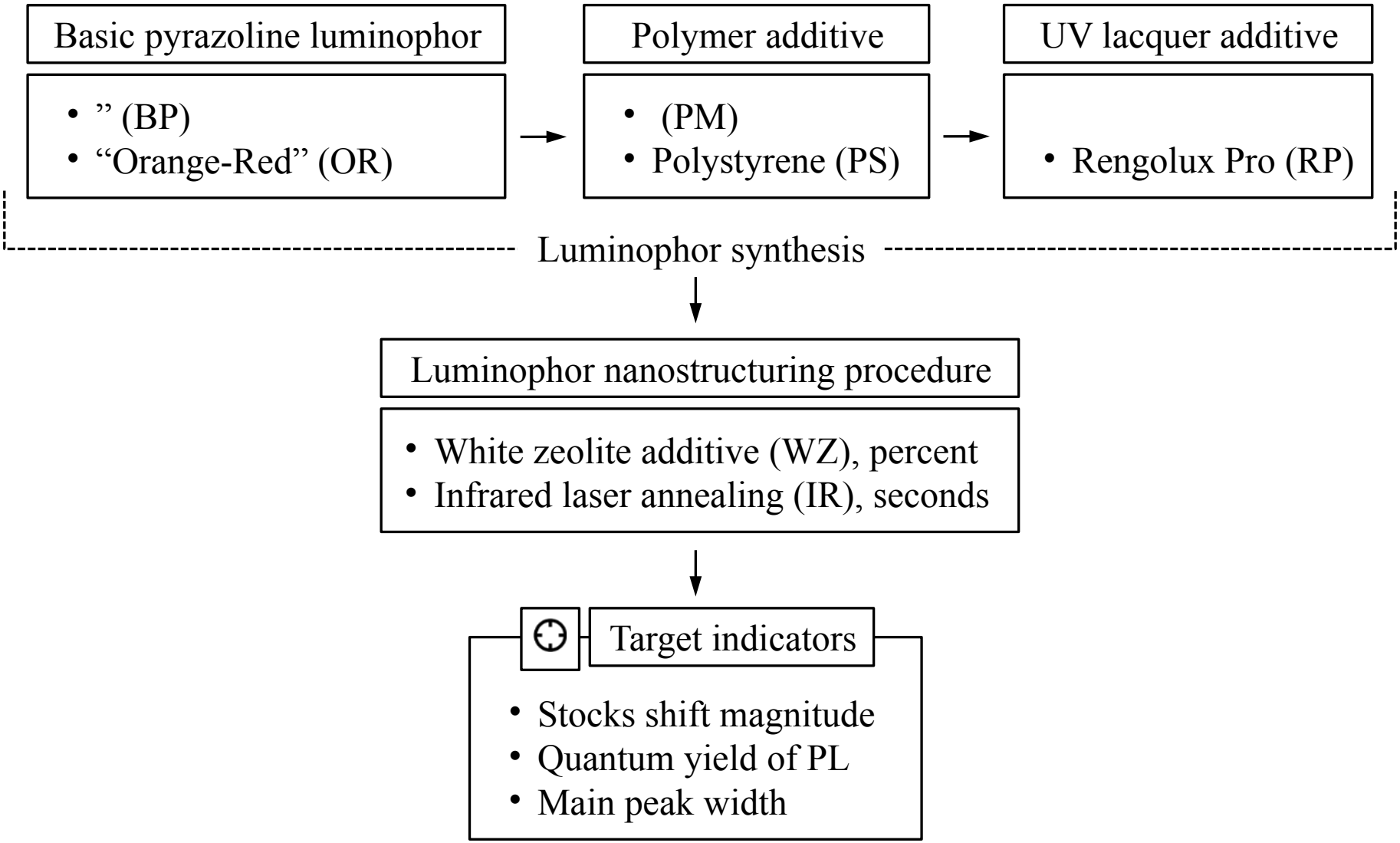
intensity spectrum of solar radiation in the lower troposphere

absorption spectrum of the polycrystalline Si photovoltaic cell

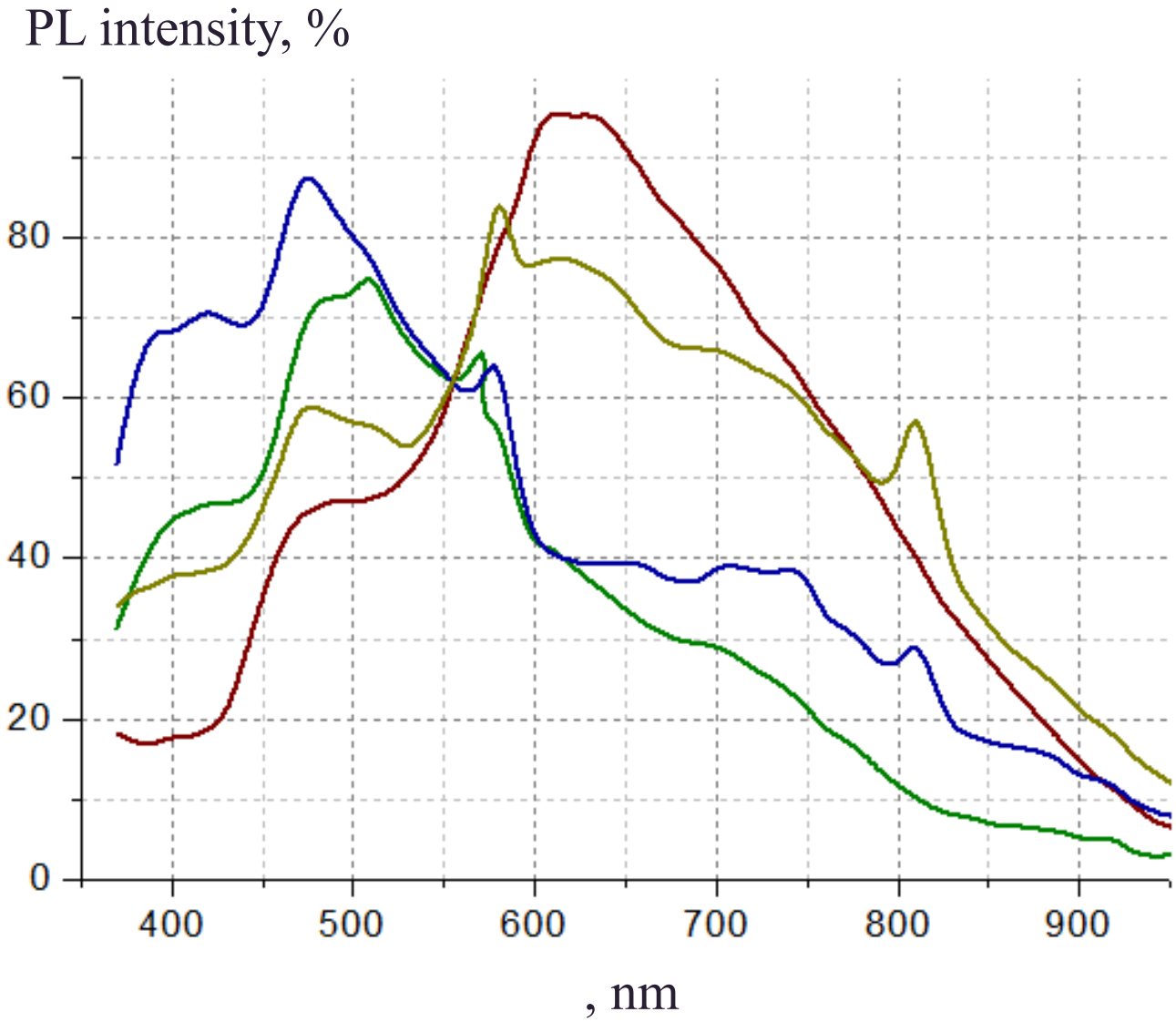
4 Photoluminescent layer based light conversion



5 Synthesis of the nanostructured luminophores



6 Pyrazoline luminophores synthesis procedure



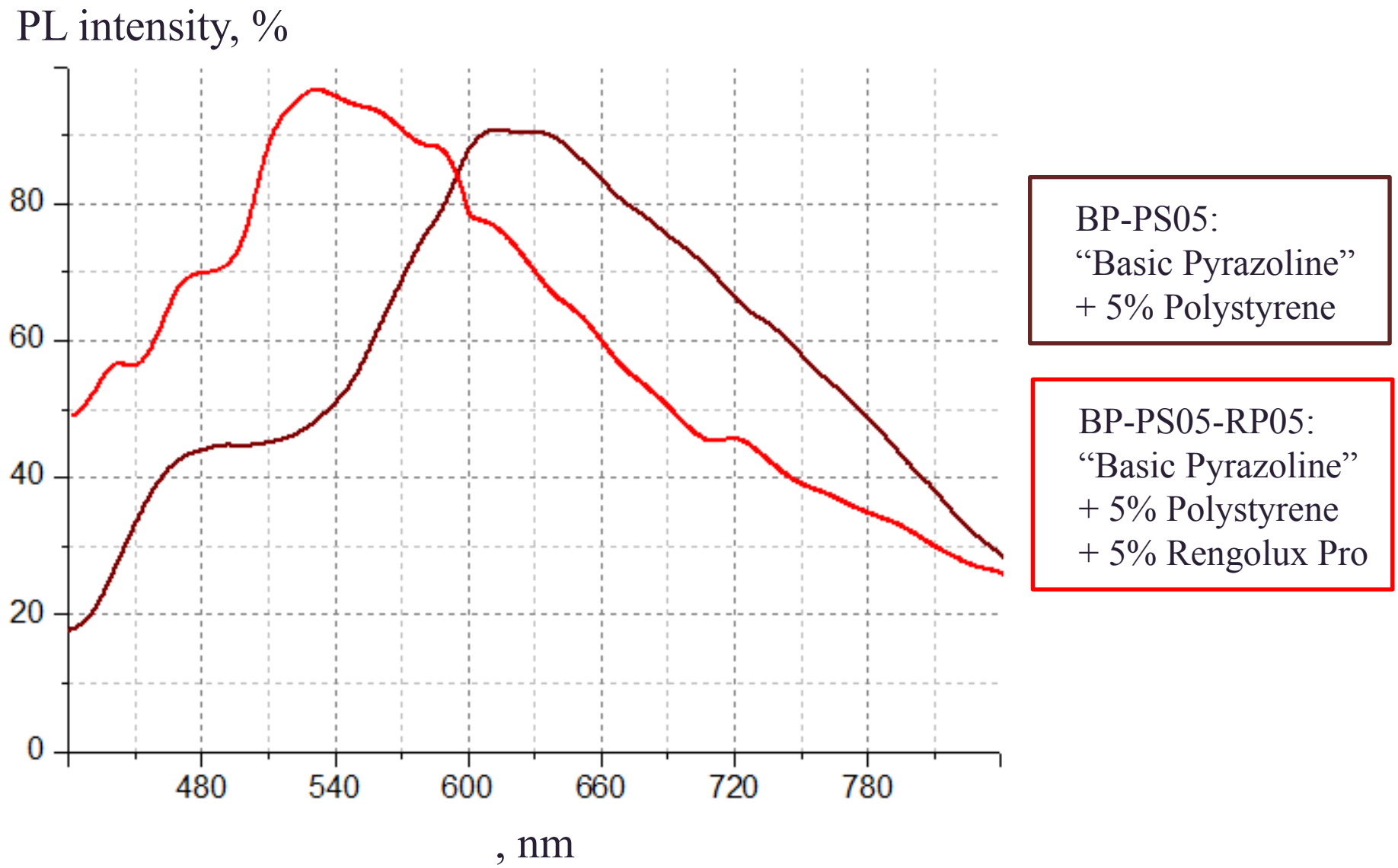
OR-PM05:
“Orange-Red”
+ 5% PMMA

BP-PM05:
“Basic Pyrazoline”
+ 5% PMMA

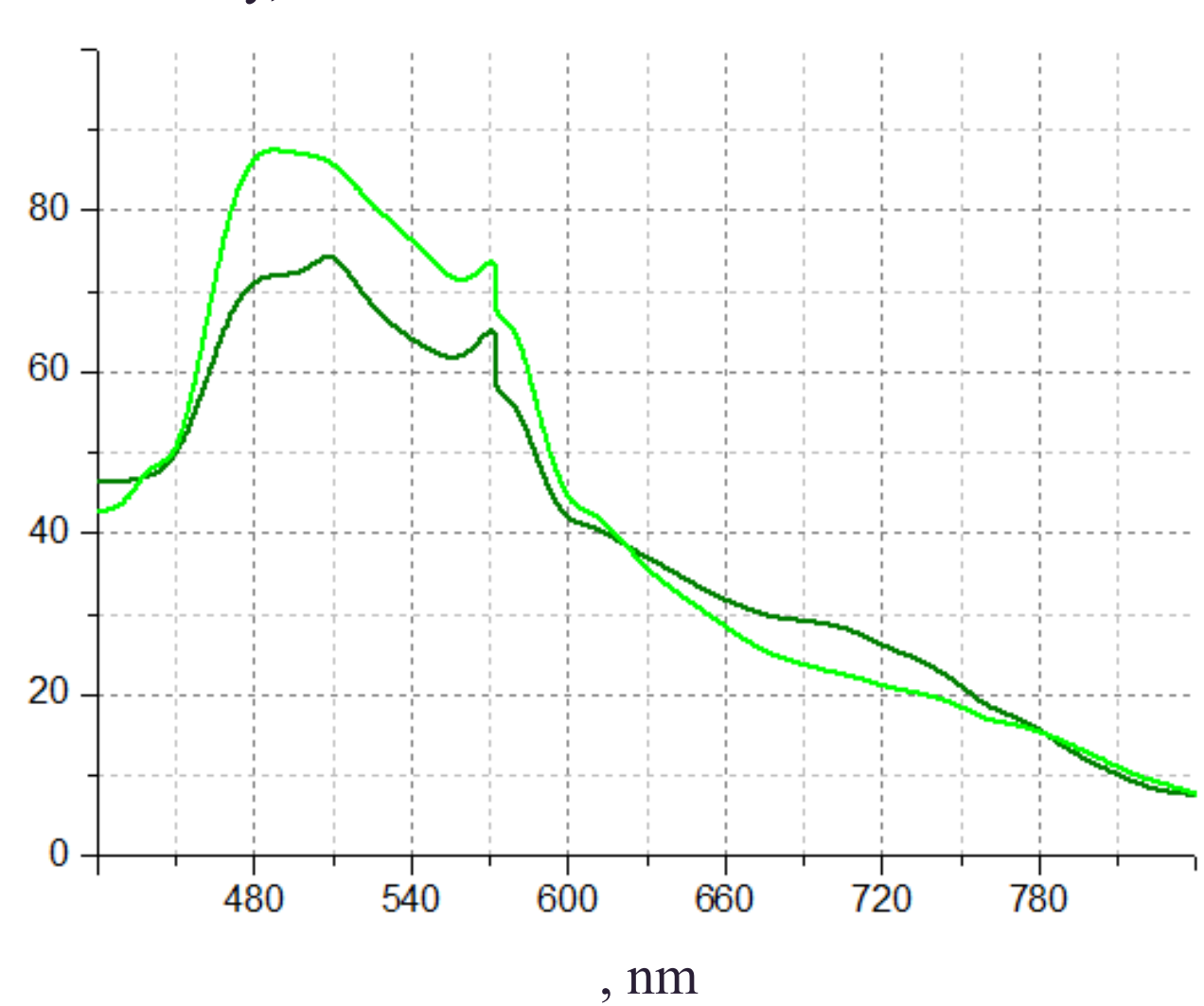
OR-PS05:
“Orange-Red”
+ 5% Polystyrene

BP-PS05:
“Basic Pyrazoline”
+ 5% Polystyrene

7 Pyrazoline luminophores optimization parameters



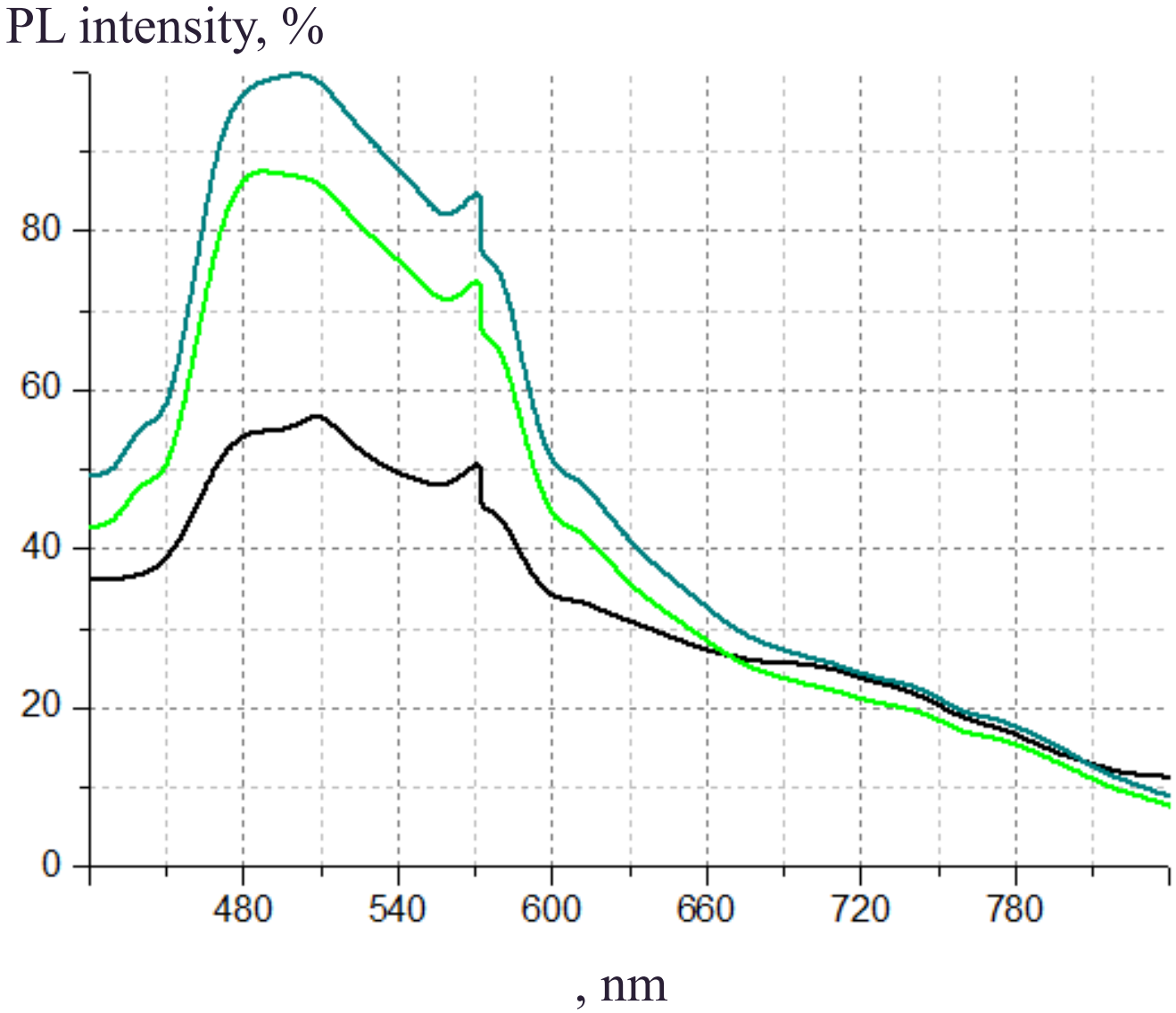
8 Pyrazoline luminophores nanostructuring method



BP-PM05:
“Basic Pyrazoline”
+ 5% PMMA

BP-PM05-WZ10:
“Basic Pyrazoline”
+ 5% PMMA
+ 10% white zeolite

9 Nanostructured luminophores annealing method



BP-PM05-WZ10:
"Basic Pyrazoline"
+ 5% PMMA
+ 10% white zeolite

IR30:
…
+ 30 s IR annealing

IR90:
…
+ 90 s IR annealing

10 The main results of the study. Conclusions

1. An effective way to optimize the characteristics of PET can be the application of photoluminescent layers based on nanostructured photoluminescent dyes with fixed Stokes shear and photoluminescence range, selected according to the absorption spectra.
2. Use of nanostructured pyrazoline dye provides efficient luminescence's energy transfer with markedly improved imaging performance. Compared to pure dyes, organic dye nanoparticles have an almost 50-fold increased quantum yield, large Stokes shifts (~250 nm), and increased photostability.
3. Obtaining the characteristics of the luminescent converter determined as a result of mathematical modeling is carried out through the use of the procedure of nanostructuring the organic photoluminescent dyes with zeolite pores and laser IR annealing.
4. Effectiveness of improving the photosensitivity and color rendering of photodetection systems by expanding the absorption spectrum of photocells was proved and the value of Stokes shift of photoluminescent materials of the coating layer for color channels was calculated.