Experimental Investigations into Physical Properties of Matrix-Based Nanocomposites in Pskov State University (Russia)

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In the last decades regular porous dielectric matrices (e.g., zeolites and opals) have attracted considerable attention of physicists and material scientists [1-5] due to their applications for novel nanocomposites with unique physical properties and 3-dimensional photonic crystals.

Opal- or zeolite-based nanocomposites (porous matrices infiltrated with guest substances – metals, semiconductors or ionic compounds) were prepared in Pskov State University and Ioffe Physico-Technical Institute and characterized by optical absorption, diffuse reflectance spectroscopy; electrical, photoelectric and thermoelectric measurements; 3 types of original measuring cells being proposed to study small zeolite single crystals. These nanocomposites demonstrate pronounced size effects (shifts of the absorption, photoconductivity and diffuse reflectance spectra, melting and Curie points etc. as compared with bulk guest materials).

Opal-based, 3-dimensional photonic and hybrid plasmonic-photonic crystals were studied by reflectance and transmission angle-resolved optical spectroscopy and ellipsometry; their structure being examined by scanning electronic microscopy and scanning probe microscopy.

One can use obtained scientific results also in physics didactics: some new approaches to theoretical and experimental study of physics of nanostructures and nanophotonics in teaching students at Pskov State University have been proposed as well.

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