

ILIA L. RASSKAZOV

theorist experienced in optics, photonics and light-matter interactions

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APPOINTMENTS

Scientist

The Institute of Optics, University of Rochester

Jul 2021 – Ongoing Rochester NY, USA

Postdoctoral Associate

The Institute of Optics, University of Rochester

Jul 2018 – Jul 2021 Rochester NY, USA

Postdoctoral Associate

**Beckman Institute for Advanced Science and Technology,
University of Illinois at Urbana-Champaign**

Jul 2016 – Jul 2018 Urbana-Champaign IL, USA

Visiting Scientist

Department of Bioengineering, University of Pennsylvania

Dec 2012 – Feb 2013 Philadelphia PA, USA

Laboratory Assistant

Siberian Federal University

Jan 2010 – Dec 2011 Krasnoyarsk, Russia

PROJECTS

Advanced Manufacturing of Photonic Smart Coatings for Utility-Scale PV Applications

NSF SBIR project #201481

2020 – 2022 Rochester NY, USA

Standoff Illuminator for Measuring Absorbance and Reflectance Infrared Light Signatures

IARPA project #IARPA-BAA-15-07

2016 – 2017 Urbana-Champaign IL, USA

Computational Framework for Non-asymptotic Homogenization with Applications to Metamaterials

NSF project #1216970

2012 – 2013 Philadelphia PA, USA

EDUCATION

Ph.D. in Physics

Siberian Federal University

2011 – 2015 Krasnoyarsk, Russia

M.Sc. Engineering majoring in Physics

Siberian Federal University

2009 – 2011 Krasnoyarsk, Russia

B.Sc. Engineering majoring in Physics

Siberian Federal University

2005 – 2009 Krasnoyarsk, Russia

INVITED TALKS

Collective lattice resonances: Plasmonics, all-dielectric photonics and beyond

Skolkovo Institute of Science and Technology

Jul 28, 2020 Moscow, Russia

Light scattering from multilayered spheres

ITMO University

Jul 7, 2020 Saint Petersburg, Russia

Electromagnetic light scattering from particles

KTH Royal Institute of Technology

May 29, 2019 Stockholm, Sweden

Plasmon-enhanced upconversion

KTH Royal Institute of Technology

May 22, 2019 Stockholm, Sweden

REFEREES

Prof. P. Scott Carney

@ Chief Science and Technology Officer, Optica

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Prof. Hans Ågren

@ Uppsala University

✉ hans.agren@physics.uu.se

CONFERENCE TALKS

- Frontiers in Optics, Washington DC, **United States**, November 2021
- METANANO 2021, Tbilisi, **Georgia**, September 2021
- The 19th Electromagnetic and Light Scattering Conference, **Online**, 2021
- METANANO 2019, St. Petersburg, **Russia**, July 2019
- Advanced Photonics Congress, Zurich, **Switzerland**, July 2018
- The 17th Electromagnetic and Light Scattering Conference, College Station TX, **United States**, March 2018
- The International Conference on Coherent and Nonlinear Optics/ International Conference on Lasers, Applications and Technologies, Minsk, **Belarus**, September 2016
- The 15th Electromagnetic and Light Scattering Conference, Leipzig, **Germany**, June 2015
- Days on Diffraction 2015, St. Petersburg, **Russia**, May 2015
- Laser-light and Interactions with Particles (LIP2014), Marseille, **France**, August 2014
- International Conference on Coherent and Nonlinear Optics (ICONO 2013), Moscow, **Russia**, June 2013

SYNERGISTIC



Science Mentors Program
supporting junior scholars



Scientific Expert
French National Research Agency (ANR),
Generic Call 2019



Developer
STRATIFY: Open-access MATLAB software
for versatile modeling of light scattering
from multilayered spheres



Topic Editor
Photonics, Frontiers in Physics



Reviewer
114 manuscripts for major publishers: American Chemical Society (ACS), American Institute of Physics (AIP), Elsevier, Frontiers, Institute of Physics (IOP), MDPI, Nature Publishing Group (NPG), OPTICA (former OSA), Royal Society of Chemistry (RSC), Springer, Wiley



Professional Societies
OPTICA, ACS

ARTICLES HIGHLIGHTS

- 1 Extraordinary fluorescence enhancement in metal-dielectric core-shell nanoparticles**
I. L. Rasskazov, A. Moroz, and P. S. Carney, *Journal of Physical Chemistry Letters* 12, 6425–6430 (2021)
 - Developed a novel concept of metal-dielectric nanocavities for extraordinary (≈ 3000) enhanced quenching-free fluorescence;
 - Conceived the idea, performed theoretical and numerical studies
 - Featured on the journal cover.
- 2 Collective lattice resonances: Plasmonics and beyond**
A. D. Utyushev, V. I. Zakomirnyi, and I. L. Rasskazov, *Reviews in Physics* 6, 100051 (2021)
 - Unique review comprehensively summarizing over 400 manuscripts with recent progress in collective lattice resonances across plasmonics, all-dielectric and two-dimensional photonics;
 - Conceived the idea and concept, guided undergraduate and graduate students to prepare the manuscript;
 - Consistently one of the most cited and downloaded article in the journal.
- 3 Critical role of shell in enhanced fluorescence of metal-dielectric core-shell nanoparticles**
S. Sun, I. L. Rasskazov, P. S. Carney, T. Zhang, and A. Moroz, *Journal of Physical Chemistry C* 124, 13365–13373 (2020)
 - Once-and-for-all defined the optimal regimes for plasmon-enhanced fluorescence via metal-dielectric core-shell nanoparticles;
 - Developed one-of-a-kind software, performed calculations.
- 4 Plasmonic nano-shells: atomistic discrete interaction versus classic electrodynamics models**
V. I. Zakomirnyi, I. L. Rasskazov, L. K. Sørensen, P. S. Carney, Z. Rinkevicius, and H. Ågren, *Physical Chemistry Chemical Physics* 22, 13467–13473 (2020)
 - Using the extended discrete interaction model and Mie theory, investigated 1-15 nm size metallic nanoshells;
 - Developed theoretical model and numerical implementation;
 - Featured among 2020 PCCP Hot articles.

5 Collective lattice resonances in arrays of dielectric nanoparticles: a matter of size

V. I. Zakomirnyi, A. E. Ershov, V. S. Gerasimov, S. V. Karpov, H. Ågren, and I. L. Rasskazov, *Optics Letters* 44, 5743–5746 (2019)

- Demonstrated that, surprisingly, for sufficiently large arrays of all-dielectric nanoparticles, electric or magnetic dipole collective lattice resonances may differ significantly from the ones calculated for infinite arrays with the same nanoparticle sizes and interparticle distances;
- Conceived the idea and guided the study.

PUBLICATIONS

Journal Articles

- ³⁶I. L. Rasskazov and A. Moroz, Is there a proper figure of merit for a plasmonic structure involved in metal-enhanced fluorescence?, *Plasmonics (in production)* (2022).
- ³⁵L. Wang, I. L. Rasskazov, and P. S. Carney, Clausius-Mossotti relation revisited: Media with electric and magnetic response, *submitted* (2022).
- ³⁴W. Xu, I. L. Rasskazov, H. Liu, Y. Ji, J. Hu, D. Zhou, B. Dong, H. Ågren, and H. Song, Photonic crystal photoelectric devices based on perovskite materials, *submitted* (2022).
- ³³R. Gaponenko, A. Moroz, I. L. Rasskazov, K. Ladutenko, A. Shcherbakov, and P. Belov, Harnessing superdirectivity in dielectric spherical multilayer antennas, *Physical Review B* 104, 195406 (2021).
- ³²V. S. Gerasimov, A. E. Ershov, R. G. Bikbaev, I. L. Rasskazov, I. L. Isaev, P. N. Semina, A. S. Kostyukov, V. I. Zakomirnyi, S. P. Polyutov, and S. V. Karpov, Plasmonic lattice Kerker effect in ultraviolet-visible spectral range, *Physical Review B* 103, 035402 (2021).
- ³¹A. S. Kostyukov, A. E. Ershov, R. G. Bikbaev, V. S. Gerasimov, I. L. Rasskazov, S. V. Karpov, and S. P. Polyutov, Substrate-mediated lattice Kerker effect in Al metasurfaces, *Journal of the Optical Society of America B* 38, C78–C83 (2021).
- ³⁰A. S. Kostyukov, I. L. Rasskazov, V. S. Gerasimov, S. P. Polyutov, S. V. Karpov, and A. E. Ershov, Multipolar lattice resonances in plasmonic finite-size metasurfaces, *Photonics* 8, 109 (2021).
- ²⁹I. L. Rasskazov, A. Moroz, and P. S. Carney, Extraordinary fluorescence enhancement in metal-dielectric core-shell nanoparticles, *Journal of Physical Chemistry Letters* 12, 6425–6430 (2021).
- ²⁸I. L. Rasskazov, V. I. Zakomirnyi, A. D. Utyushev, P. S. Carney, and A. Moroz, Remarkable predictive power of the modified long wavelength approximation, *Journal of Physical Chemistry C* 125, 1963–1971 (2021).
- ²⁷A. D. Utyushev, V. I. Zakomirnyi, and I. L. Rasskazov, Collective lattice resonances: Plasmonics and beyond, *Reviews in Physics* 6, 100051 (2021).
- ²⁶L. Wang, I. L. Rasskazov, and P. S. Carney, Clustering diffused-particle method for scattering from large ensembles of electromagnetically polarizable particles, *Physical Review B* 104, 115418 (2021).
- ²⁵I. L. Rasskazov, P. S. Carney, and A. Moroz, Intriguing branching of the maximum position of the absorption cross section in Mie theory explained, *Optics Letters* 45, 4056–4059 (2020).
- ²⁴I. L. Rasskazov, P. S. Carney, and A. Moroz, STRATIFY: a comprehensive and versatile MATLAB code for a multilayered sphere, *OSA Continuum* 3, 2290–2309 (2020).
- ²³S. Sun, I. L. Rasskazov, P. S. Carney, T. Zhang, and A. Moroz, Critical role of shell in enhanced fluorescence of metal-dielectric core-shell nanoparticles, *Journal of Physical Chemistry C* 124, 13365–13373 (2020).
- ²²A. D. Utyushev, I. L. Isaev, V. S. Gerasimov, A. E. Ershov, V. I. Zakomirnyi, I. L. Rasskazov, S. P. Polyutov, H. Ågren, and S. V. Karpov, Engineering novel tunable optical high-Q nanoparticle array filters for a wide range of wavelengths, *Optics Express* 28, 1426–1438 (2020).
- ²¹A. D. Utyushev, V. I. Zakomirnyi, A. E. Ershov, V. S. Gerasimov, S. V. Karpov, and I. L. Rasskazov, Collective lattice resonances in all-dielectric nanostructures under oblique incidence, *Photonics* 7, 24 (2020).
- ²⁰V. I. Zakomirnyi, I. L. Rasskazov, L. K. Sørensen, P. S. Carney, Z. Rinkevicius, and H. Ågren, Plasmonic nano-shells: atomistic discrete interaction versus classic electrodynamics models, *Physical Chemistry Chemical Physics* 22, 13467–13473 (2020).
- ¹⁹V. S. Gerasimov, A. E. Ershov, R. G. Bikbaev, I. L. Rasskazov, I. V. Timofeev, S. P. Polyutov, and S. V. Karpov, Engineering mode hybridization in regular arrays of plasmonic nanoparticles embedded in 1D photonic crystal, *Journal of Quantitative Spectroscopy and Radiative Transfer* 224, 303–308 (2019).
- ¹⁸A. S. Kostyukov, A. E. Ershov, V. S. Gerasimov, S. A. Filimonov, I. L. Rasskazov, and S. V. Karpov, Super-efficient laser hyperthermia of malignant cells with core-shell nanoparticles based on alternative plasmonic materials, *Journal of Quantitative Spectroscopy and Radiative Transfer* 236, 106599 (2019).
- ¹⁷I. L. Rasskazov, R. Singh, P. S. Carney, and R. Bhargava, Extended multiplicative signal correction for infrared microspectroscopy of heterogeneous samples with cylindrical domains, *Applied Spectroscopy* 73, 859–869 (2019).

- ¹⁶I. L. Rasskazov, A. Moroz, and P. S. Carney, Electromagnetic energy in multilayered spherical particles, *Journal of the Optical Society of America A* **36**, 1591–1601 (2019).
- ¹⁵V. I. Zakomirnyi, A. E. Ershov, V. S. Gerasimov, S. V. Karpov, H. Ågren, and I. L. Rasskazov, Collective lattice resonances in arrays of dielectric nanoparticles: a matter of size, *Optics Letters* **44**, 5743–5746 (2019).
- ¹⁴V. I. Zakomirnyi, S. V. Karpov, H. Ågren, and I. L. Rasskazov, Collective lattice resonances in disordered and quasi-random all-dielectric metasurfaces, *Journal of the Optical Society of America B* **36**, E21–E29 (2019).
- ¹³I. L. Rasskazov, L. Wang, C. J. Murphy, R. Bhargava, and P. S. Carney, Plasmon-enhanced upconversion: engineering enhancement and quenching at nano and macro scales, *Optical Materials Express* **8**, 3787–3804 (2018).
- ¹²V. Zakomirnyi, I. Rasskazov, V. Gerasimov, A. Ershov, S. Polyutov, S. Karpov, and H. Ågren, Titanium nitride nanoparticles as an alternative platform for plasmonic waveguides in the visible and telecommunication wavelength ranges, *Photonics and Nanostructures - Fundamentals and Applications* **30**, 50–56 (2018).
- ¹¹A. E. Ershov, V. S. Gerasimov, A. P. Gavrilyuk, S. V. Karpov, V. I. Zakomirnyi, I. L. Rasskazov, and S. P. Polyutov, Thermal limiting effects in optical plasmonic waveguides, *Journal of Quantitative Spectroscopy and Radiative Transfer* **191**, 1–6 (2017).
- ¹⁰V. S. Gerasimov, A. E. Ershov, S. V. Karpov, A. P. Gavrilyuk, V. I. Zakomirnyi, I. L. Rasskazov, H. Ågren, and S. P. Polyutov, Thermal effects in systems of colloidal plasmonic nanoparticles in high-intensity pulsed laser fields [Invited], *Optical Materials Express* **7**, 555–568 (2017).
- ⁹I. L. Rasskazov, N. Spegazzini, P. S. Carney, and R. Bhargava, Dielectric sphere clusters as a model to understand infrared spectroscopic imaging data recorded from complex samples, *Analytical Chemistry* **89**, 10813–10818 (2017).
- ⁸V. I. Zakomirnyi, I. L. Rasskazov, S. V. Karpov, and S. P. Polyutov, New ideally absorbing Au plasmonic nanostructures for biomedical applications, *Journal of Quantitative Spectroscopy and Radiative Transfer* **187**, 54–61 (2017).
- ⁷V. I. Zakomirnyi, I. L. Rasskazov, V. S. Gerasimov, A. E. Ershov, S. P. Polyutov, and S. V. Karpov, Refractory titanium nitride two-dimensional structures with extremely narrow surface lattice resonances at telecommunication wavelengths, *Applied Physics Letters* **111**, 123107 (2017).
- ⁶I. L. Rasskazov, S. V. Karpov, G. Y. Panasyuk, and V. A. Markel, Overcoming the adverse effects of substrate on the waveguiding properties of plasmonic nanoparticle chains, *Journal of Applied Physics* **119**, 043101 (2016).
- ⁵I. L. Rasskazov, S. V. Karpov, and V. A. Markel, Surface plasmon polaritons in curved chains of metal nanoparticles, *Physical Review B* **90**, 075405 (2014).
- ⁴I. L. Rasskazov, S. V. Karpov, and V. A. Markel, Waveguiding properties of short linear chains of nonspherical metal nanoparticles, *Journal of the Optical Society of America B* **31**, 2981–2989 (2014).
- ³S. V. Karpov and I. L. Rasskazov, Simulation of conditions for fabrication of optical nanowaveguides in the form of chains of spherical metal nanoparticles by electrostatic functionalization of the process substrate, *Colloid Journal* **75**, 279–288 (2013).
- ²I. L. Rasskazov, V. A. Markel, and S. V. Karpov, Transmission and spectral properties of short optical plasmon waveguides, *Optics and Spectroscopy* **115**, 666–674 (2013).
- ¹I. L. Rasskazov, S. V. Karpov, and V. A. Markel, Nondecaying surface plasmon polaritons in linear chains of silver nanospheroids, *Optics Letters* **38**, 4743–4746 (2013).