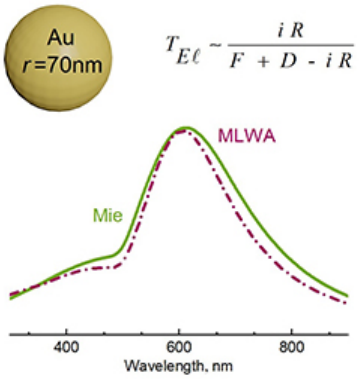
Modifying Classical Solution for Mie Scattering Theory

An international research team with SibFU scholars onboard have come up with a more straightforward and multifunctional method for simulating the optical properties of spherical nanoparticles.



”In physics, electrodynamics and optics, there is the classical problem when a spherical object scatters e-m radiation. For our case, the material does not matter, so the object can be of metal or ceramics or other. The most relevant example is the light scattering by spherical particles. Gustav Mie, a German scholar, solved this problem long ago, but this solution still seems complicated and not very convenient to use. We have significantly simplified the formulations proposed by Mie, replacing trigonometric functions by simple mathematical formulas, known to every pupil of senior years,” said **Ilia Rasskazov**, a coauthor of the research, postdoc at The Institute of Optics, University

The researchers explained that at the first stage of the proposed solution, they considered a spherical particle in a static condition. Its size parameters can be omitted, but the particle reacts to an electromagnetic field. At the next step, they studied the particle as one having specific dimensions, i.e. radius. At the third stage, the researchers added such parameter as the heterogeneous distribution of the field inside the ball. The final formula is highly accurate and useful for experimenting physicists solving particular applied problems.

”Modern life with its intense rhythm requires optimization of the most of processes. Gustav Mie proposed an elegant solution to the problem of light scattering by spherical particles, which has deservedly become classic, and students study it within the university course. However, our simplified formula significantly saves time and resources and boosts the speed of calculations. It facilitates numerical simulation and reveals the essence of the ongoing physical processes without burdening the analysis with further mathematics formulas. For such a rapidly developing science as optics, this is exactly what we need,” noted **Vadim Zakomirny**, a research fellow from the International Research Center for Spectroscopy and Quantum Chemistry, SibFU.

The researchers predict the results to be applied particularly in sensing, where nanoparticles are used as sensors, as well as in biomedicine. For example, with heated magnetic nanoparticles, it will be possible to destroy malignant tumours.

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