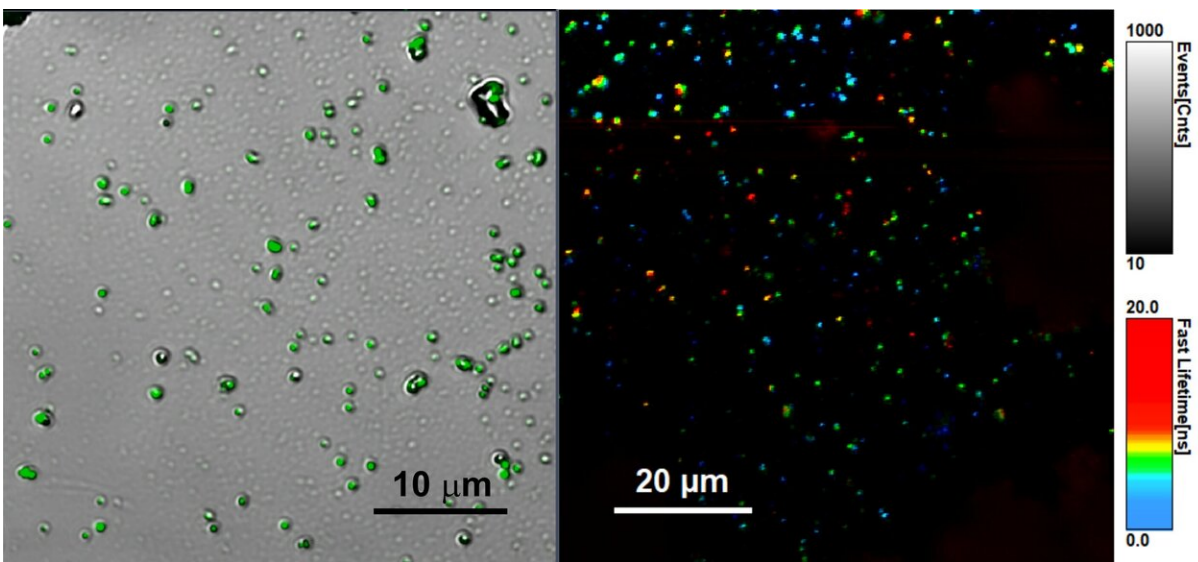


Scientists develop stable luminescent composite material based on perovskite nanocrystals

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Article Illustration, Stable luminescent composite microspheres based on porous silica with embedded CsPbBr₃ perovskite nanocrystals Credit: ChemNanoMat

An international team of scientists that includes researchers from ITMO University has developed a new composite material based on perovskite nanocrystals for the purpose of creating miniature light sources with improved output capacity. The introduction of perovskite nanocrystals into porous glass microparticles made it possible to increase their operating time by almost three times, and the subsequent coating of

these particles with polymers—to increase the stability of their optical properties when underwater, which is especially important for the purposes of creating light sources for application in biological media. The results have been published in *ChemNanoMat*.

Perovskite [nanocrystals](#) are a subject of heavy research in modern materials science. They have excellent optical properties including the purity and brightness of emitted light, which makes them appealing for use in modern laser systems. At the same time, perovskites are unstable in the air, when interacting with water, as well as under intensive illumination. This is why the improvement of [perovskite nanocrystals'](#) stability is one of the key tasks that stands before the scientific community.

An international team of scientists that includes researchers from ITMO University, Ioffe Institute, as well as City University of Hong Kong, studied various conditions for the introduction of perovskite nanocrystals into porous spheres of silicon dioxide that can act as both protective matrices and optical resonators for spontaneous amplification of the luminescence signal. Their research identified the optimal parameters for the manufacturing of a perovskite nanocrystals-based luminescent material where the emission intensity stayed at 85% of the original, which is significantly higher than that of the same nanocrystals without a protection matrix. Such composite materials also remained stable under the effect of intensive UV radiation, which can be used as a light pumping source when designing laser systems.

"Our next step had to do with the development of a protective layer for such light-emitting microspheres with [perovskite](#) nanocrystals for the purposes of moving them into hydrous solutions," says Elena Ushakova, an associate professor at ITMO's Faculty of Photonics and Optical Information Technology. "In order to do this, we used the layer-by-layer technique of depositing alternating layers of oppositely charged

materials on the microspheres' surface. The resulting luminescent spheres can be dispersed in water while retaining their optical properties, which is important from the standpoint of their further application as [light](#) sources in biological tissues."

More information: Elena Ushakova et al. Stable luminescent composite microspheres based on porous silica with embedded CsPbBr₃ perovskite nanocrystals, *ChemNanoMat* (2020). [DOI: 10.1002/cnma.202000154](#)

Provided by ITMO University

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