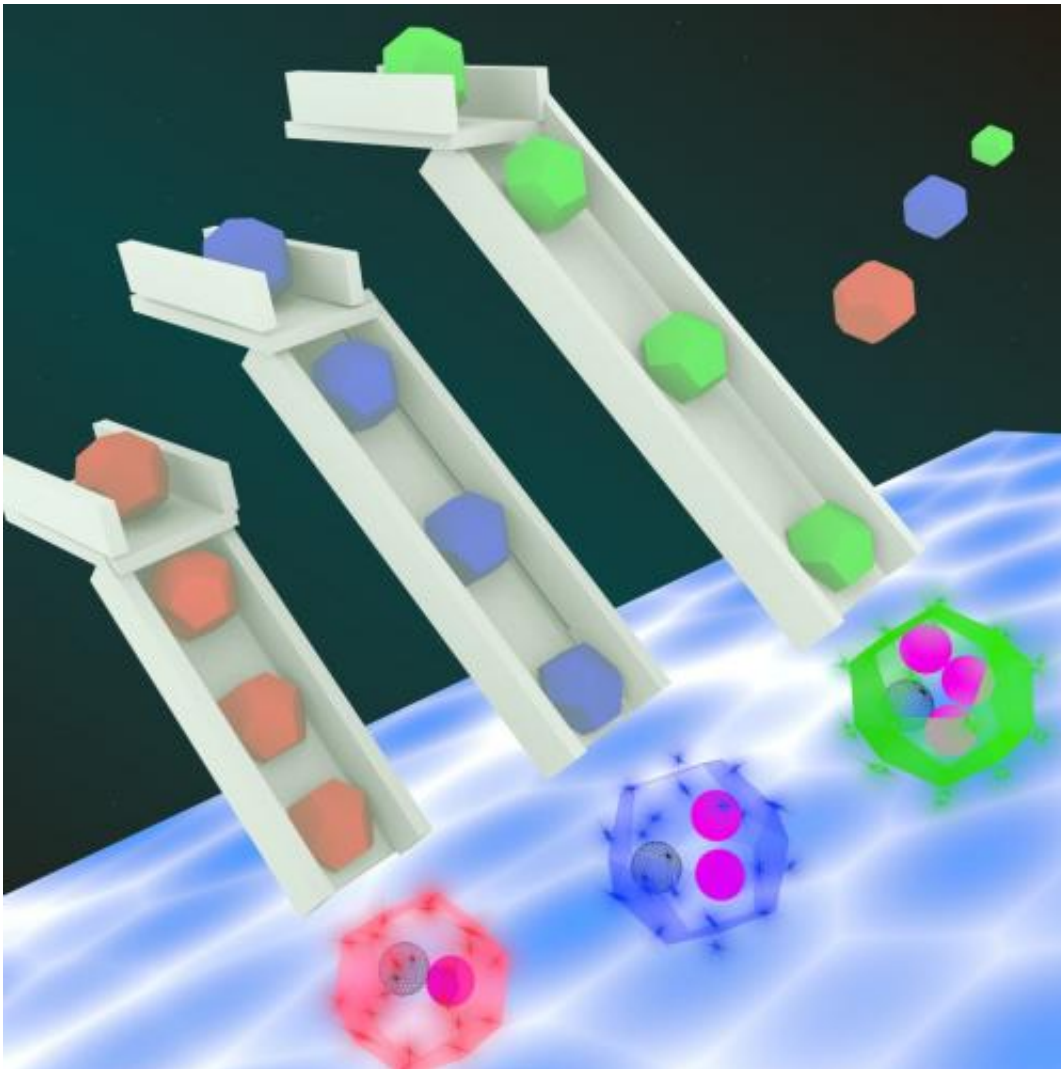


New biotechnology offers rapid diagnostics and anti drug counterfeiting

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An artist's impression of the lifetime concept.

(Phys.org) —The revelation of a new optical dimension in nanophotonics offers untapped clinical potential in non-invasive cancer diagnostic kits, rapid pathogen screening for acute infection, and invisible coding for identification of authentic pharmaceuticals.

Lead researchers Yiqing Lu and Dayong Jin from Macquarie University have invented a new generation of [nanocrystals](#), called " τ -Dots".

τ -Dots can be coded in the time dimension in addition to colours, that is, their luminescence lifetimes (τ) can be engineered and assigned to a single nanoparticle.

"This extra dimension offers an exponential boost in the total number of potential combinations, which can be used for multiple medical tasks or diagnoses simultaneously," said Lu.

"These nanocrystals can form combination codes, like barcodes, to form a vast library of distinguishable molecular probes, which can be used for complex diagnostics. Screening tests can more quickly and accurately identify the cause of infection, residue cancers at an early stage, and locate the specific molecular targets for targeted drug therapies. " said ARC Future Fellow Dr Jin.

Co-author, Professor J Paul Robinson from Purdue University said "This toolset is really a paradigm shift for identifying rare events in high-noise environments typical in biological systems such as cancer detection, high throughput screening and also in the biodetection domain."

The τ -Dots also have application in improving the storage capacity and security of data, and can invisibly mark genuine drug products as an anti-counterfeit measure, says Lu.

"Our ability to layer the τ -Dots' lifetimes enables higher density storage

than was previously possible. We can also protect the data by codifying the τ -Dots until they are essentially impossible to crack.

"By applying τ -Dots to any surface, we can leave a secret message or mark on any product, which will only be revealed by a specially designed scanner. This has huge potential in confirming the authenticity of any product, from pharmaceutical drugs to medical courier supplies."

More information: "Tunable lifetime multiplexing using luminescent nanocrystals." Authors: Yiqing Lu, Jiangbo Zhao, Run Zhang, Yujia Liu, Deming Liu, Ewa M. Goldys, Xusan Yang, Peng Xi, Anwar Sunna, Jie Lu, Yu Shi, Robert C. Leif, Yujing Huo, Jian Shen, James A. Piper, J. Paul Robinson and Dayong Jin. *Nature Photonics*, 2013. [DOI: 10.1038/nphoton.2013.322](https://doi.org/10.1038/nphoton.2013.322)

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