Centre for Nanoscale BioPhotonics
ARC CENTRE OF EXCELLENCE

MEDIA RELEASE

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Tiny gemstones best for long-term imaging at the nanoscale

A new study published in the journal 'Advanced Optical Materials' has shown that minuscule diamonds and rubies could be the nanomaterials of choice for researchers aiming to explore cellular and molecular processes inside of the living body.

The ruby and diamond particles, more than 1000 times smaller than the diameter of a hair, were tested alongside other nanoparticles for use in biological imaging, and were shown to have a high degree of stability, critical to achieving imaging success.

"Fluorescing nanoparticles can be used as 'tiny lamps' that when placed in the body, are able to light up cells and their internal processes", explained Dr Philipp Reineck at RMIT University, lead scientist on the study and researcher at the ARC Centre of Excellence for Nanoscale BioPhotonics (CNBP).

"We shine light at the biological sample of interest in a very controlled way and the nanomaterials send light back, helping us to see very specifically what is happening, right down to a molecule and protein level. This is the area we're focused on, exploring how the 'very small' can help us in answering some of the very big questions in biology."

In the study, Dr Reineck and his team compared seven types of fluorescent nanomaterials – organic dyes, semiconductor quantum dots, fluorescent beads, carbon dots and gold nanoclusters, as well as the nano sized diamonds and rubies. Characteristics tested for included levels of fluorescence brightness and photostability (resistance to change under the influence of light), as well as how efficiently these new materials can be imaged with standard microscopes used in biology.

"Nanomaterials have widely differing characteristics," said Dr Reineck. "We need to determine which materials will work best in which imaging application."

"What our study clearly shows is that nanodiamonds and nanorubies are excellent materials for long-term biological imaging. These two materials provide acceptable levels of brightness and the best photostability by far, when compared to the other materials that were tested."

In other study findings, Dr Reineck notes clear trade-offs in many of the nanomaterials examined.

"We find that ideal levels of photostability generally mean a sacrifice in brightness and vice versa," he said. "In our testing for example, the organic dyes and carbon dots were much brighter than the rubies and the diamonds - but photobleaching (or fading) was a major issue, impacting their practical imaging use."

Dr Reineck's next step will be to work closely with biologists and medical researchers within the CNBP to develop selected nanomaterials so that they can be used with the needed precision and reliability to light-up real-world biological environments. Future application of the materials will relate to fertility, chronic pain and heart disease research, key focus areas for the CNBP.

"The real treasure isn't the rubies or the diamonds," concluded Dr Reineck. "It will be the way in which we use these materials to shed new light on the incredibly complex processes taking place in the living body, helping us understand a whole host of matters relating to health, wellbeing and disease."

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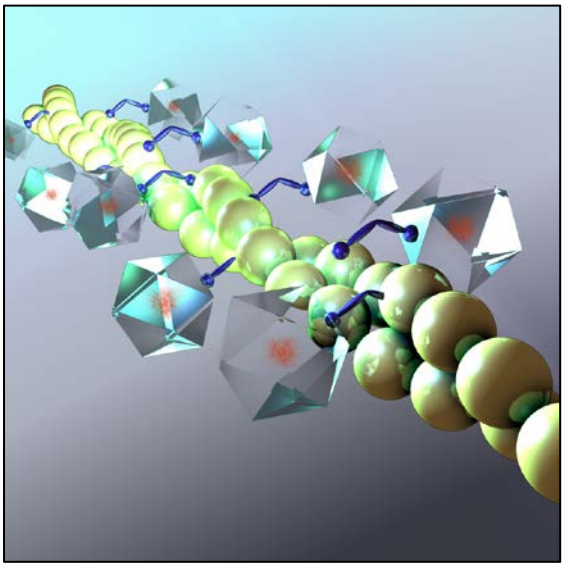
IMAGES:

Dr Philipp Reineck, CNBP Research Fellow. http://flic.kr/p/Hq16J4

Below - An artistic representation of nano-diamonds being used to light up and image a long chain of proteins. Image courtesy of Dr Carlo Bradac. http://flic.kr/p/HyanaN



RESEARCH PAPER:
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ABOUT:
The Centre for Nanoscale BioPhotonics (CNBP) is an Australian Research Council Centre of Excellence, with research focussed nodes at the University of Adelaide, Macquarie University and RMIT University. A $40m initiative, the CNBP is focused on developing new light-based imaging and sensing tools, that can measure the inner workings of cells, in the living body. http://cnbp.org.au/

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