Quantum rings and rods obtained in water with enhanced fluorescence intensity

CSIC has developed a simple, eco-friendly and easily reproducible method for the synthesis of quantum rings and rods in water. The material obtained has an enhanced fluorescent intensity and a great functionalization capacity, which makes it interesting for applications in optoelectronics and in biomedical imaging, among others.
Industrial partners are being sought to collaborate through a patent licence agreement.

An offer for Patent Licensing

Direct synthesis in water with no need of surface silanization

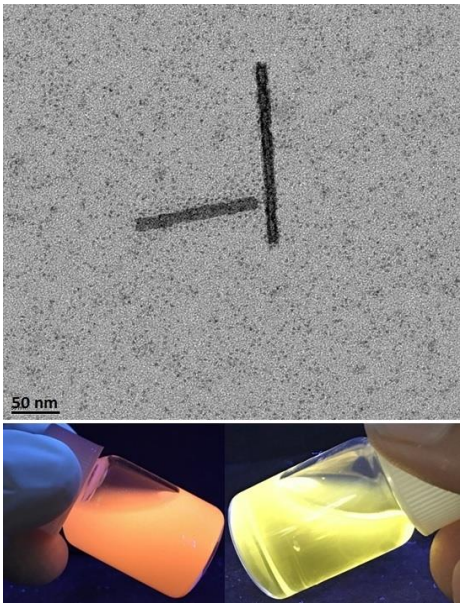
Earlier studies suggest that electronic structures and optical properties of band edge have strong dependence not only on the size but also on the shape of nanocrystals. If compared quantum rings or rods vs. quantum dots, the firsts show an enhanced fluorescent signal and significant differences in the polarization of the emission.

In order to be used in biomedical applications, quantum materials need to be synthesized in water environment, as all biological environments are water based. So far, quantum materials have been produced in organic medium, making isolation challenging, and a Surface silanization step is needed to make them soluble in water.

The present method is a colloidal hydrothermal process for obtaining quantum rings and rods in water without surface silanization. It is easy and highly reproducible with less cumbersome manipulations of the temperature and reaction conditions. The synthesis in water is also beneficial as it is easy to separate the particles after formation and it requires no post-synthesis treatment in high temperatures to obtain the particles in solid state and remove excess solvent.

These quantum rings and rods have larger absorption cross section, faster radiative decay rate, bigger Stokes shift, and can be functionalized with multiple binding moieties.

In addition, alone or embedded in a **polymeric film,** can be ideal candidates for the preparation of QLEDs, showing a much brighter emission.



TEM Images of the Quantum Rods and their fluorescent properties in aqueous solution.

Main innovations and advantages

- Low-cost process.
- Sustainable production.
- Easily scalable method.
- The enhanced fluorescent signal from Quantum Rings/Rods makes them ideal probes for single molecule tracking.
- The emission of single Quantum Ring/Rod can be reversibly switched on/off by external electric fields.
- Due to their morphology, they may be used as polarized emitters for light-emitting diodes in the field of optoelectronics or as biological labelling reagents with interest in the field of biotechnology.

Patent Status

Two Spanish patent applications filed suitable for international extension.

For more information, please contact:

Alfonso del Rey

ICMAB-CSIC

Tel.: + 34 935801853
E-mail: adelrey@icmab.es

MINISTERIO DE CIENCIA, INNOVACIÓN Y UNIVERSIDADES

CSIC
CONSEJO SUPERIOR DE INVESTIGACIONES CIENTÍFICAS