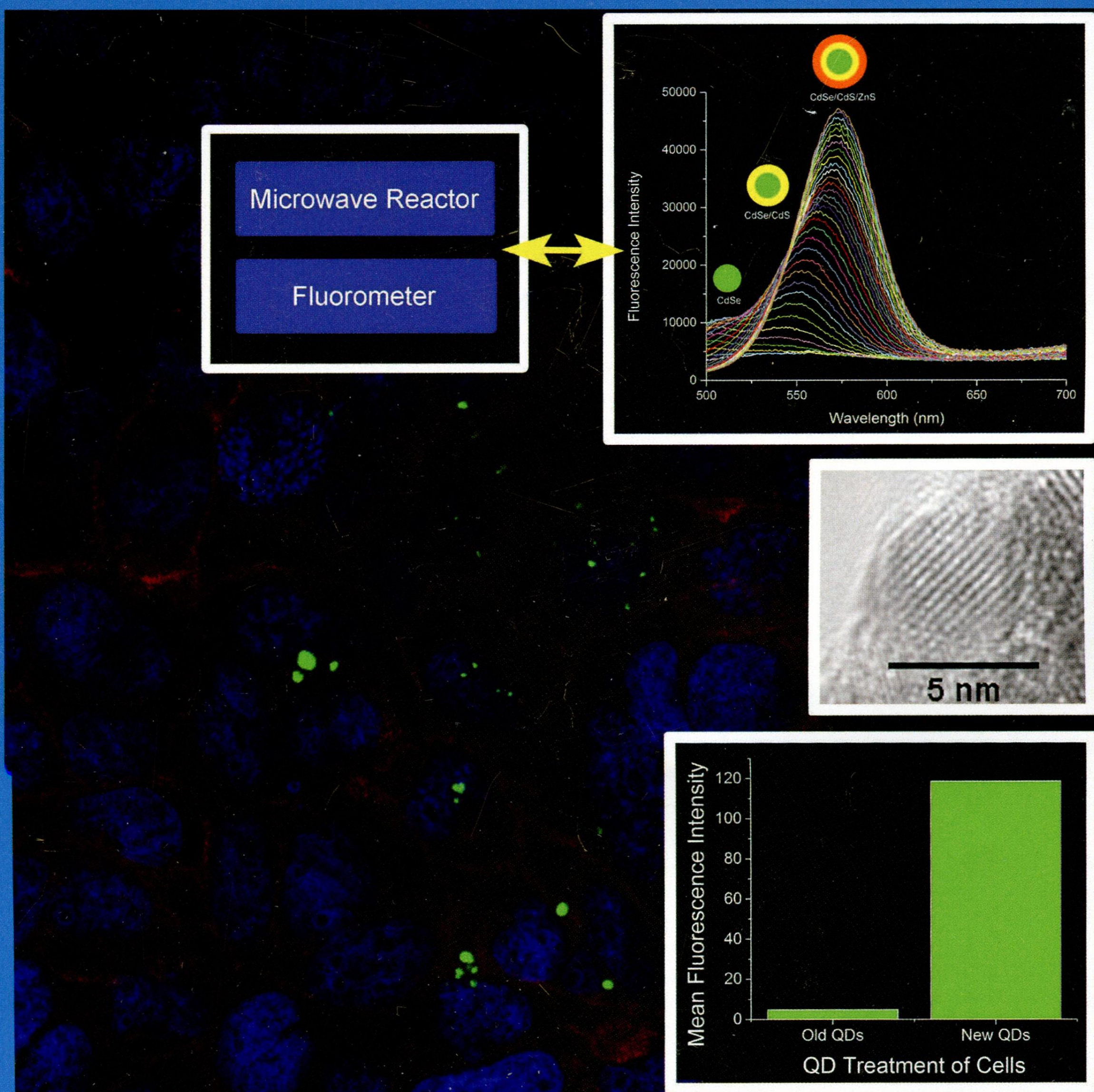
JPCCCK

SEPTEMBER 25, 2014
VOLUME 118
NUMBER 38
pubs.acs.org/JPCC

THE JOURNAL OF PHYSICAL CHEMISTRY C



Optimized Microwave Synthesis of Bright Cadmium Chalcogenide Quantum Dots and Their Cellular Uptake (see page 22258)

ENERGY CONVERSION AND STORAGE, OPTICAL AND ELECTRONIC DEVICES, INTERFACES, NANOMATERIALS, AND HARD MATTER

ACS Publications
Most Trusted. Most Cited. Most Read.

www.acs.org

THE JOURNAL OF
PHYSICAL CHEMISTRY C

SEPTEMBER 25, 2014

VOLUME 118 ISSUE 38

JPCCCK 118(38) 21741–22404 (2014)

ISSN 1932-7447

Registered in the U.S. Patent and Trademark Office

ON THE COVER: Optimized microwave synthesis of bright cadmium chalcogenide quantum dots and their cellular uptake. Fiber optic coupling of a microwave reactor with a fluorimeter allows for real-time observation of the evolution of the fluorescence of CdSe/CdS/ZnS quantum dots. With this data, it is possible to distinguish the development of the CdSe nuclei, followed by deposition of successive CdS and ZnS shells (note isosbestic point in the fluorescence data). Nucleation at 100 °C followed by microwave treatment at 155 °C led to quantum-dot formation in 55 min. Further improvement in the quantum yield of the quantum dots was possible by light irradiation during nucleation and post-microwave synthesis. Optimized quantum dots of ~5 nm size had quantum yields of 40 to 41%. With these bright quantum dots, their uptake into intestinal epithelial cells at concentrations of 16 nM could be tracked by confocal fluorescence microscopy, as seen in the background of the cover. (The blue color is from labeling of nuclei of cells by 4′6′-diamidino-2-phenylindole or DAPI, and the red color is antibody staining of E-cadherin to label cell junctions.) Mean fluorescence intensity detected by flow cytometry was markedly improved with the bright quantum dots, as seen in the bar charts. (Old quantum dots have quantum yield of 19% with a previously published microwave-based procedure.) See page 22258.

Articles

Energy Conversion and Storage; Energy and Charge Transport

Surfaces, Interfaces, Porous Materials, and Catalysis

Plasmonics, Optical Materials, and Hard Matter

Physical Processes in Nanomaterials and Nanostructures

Additions and Corrections

Ⓢ Supporting Information available via online article