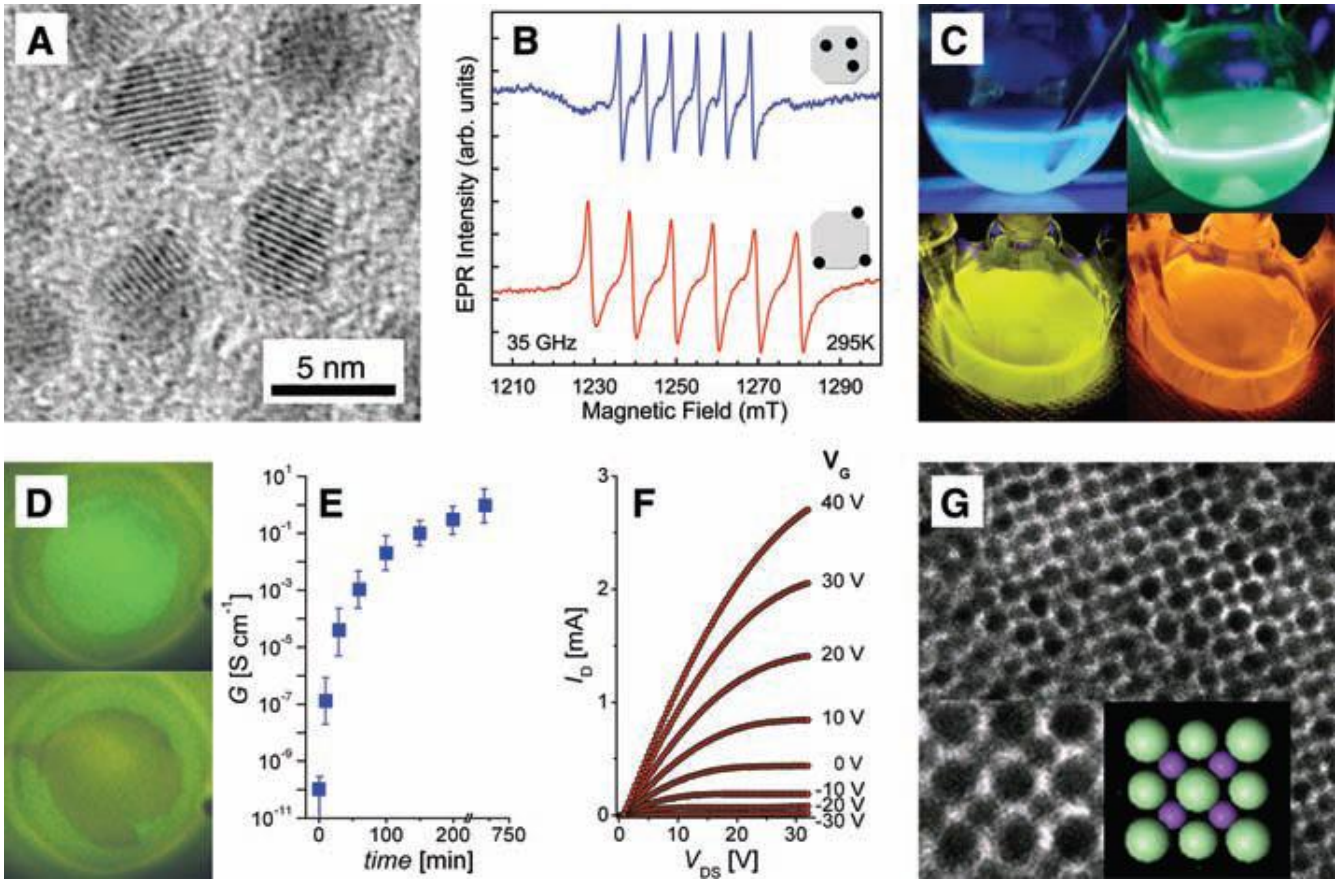
양자점(Quantum dot) 이용한 태양전지

Quantum dots



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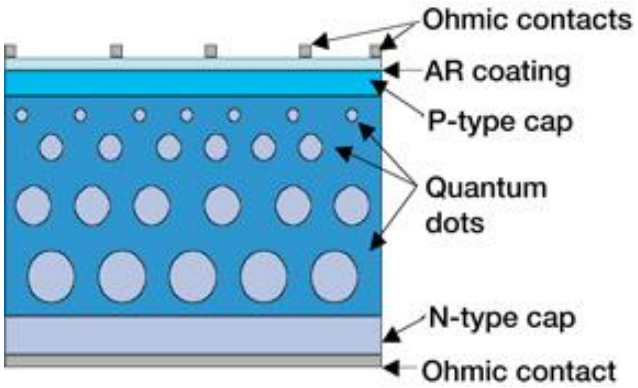
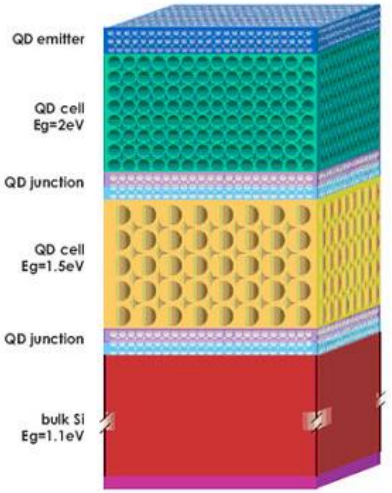
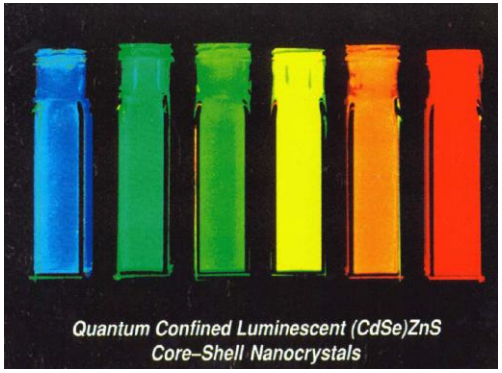
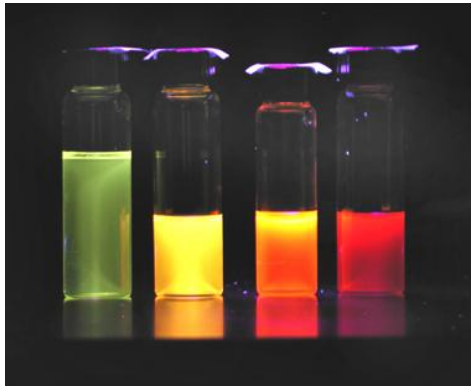
Quantum Dots Investigated for Solar Cells



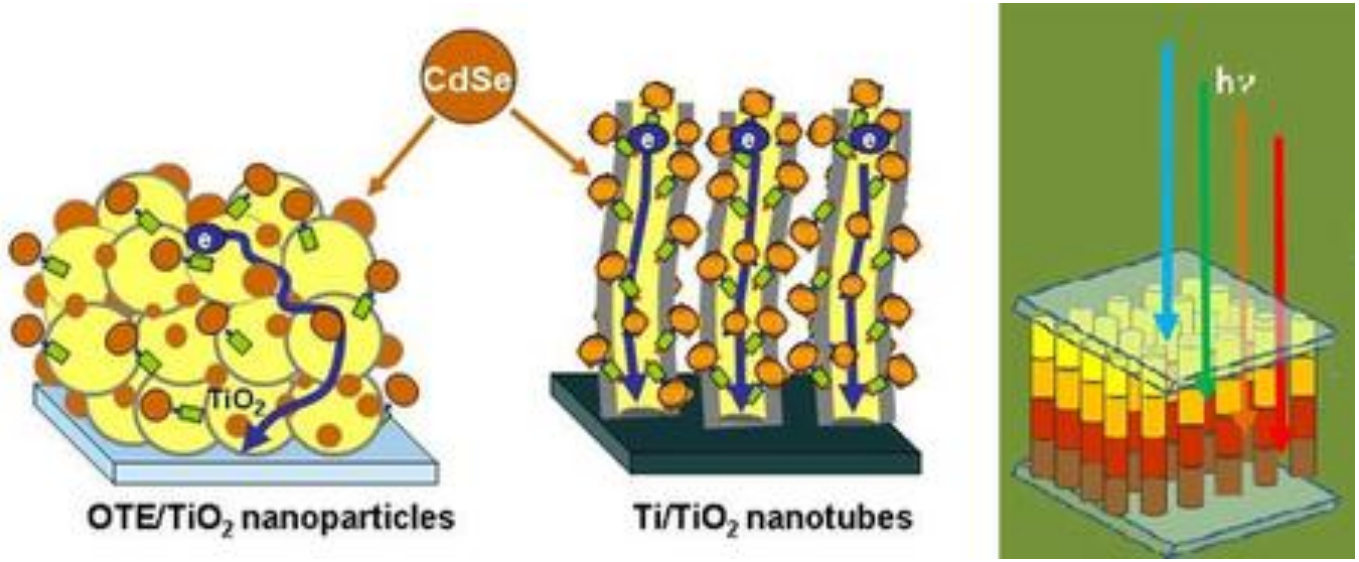






CdSe quantum dot fluorescence showing an increase in dot size going from green on the left to red on the right.

Quantum Dots May Lead to Rainbow Solar Cell



Electron transport through a structure of nanoparticles (left) and more ordered nanotubes (center) is shown. At right, different wavelengths of light can be absorbed by different-sized quantum dots layered in a "rainbow" solar cell

March 7th, 2008 By Lisa Zyga

Researchers have created solar cells made of different-sized quantum dots, each tuned to a specific wavelength of light. By arranging these quantum dots in an ordered pattern, the scientists hope that they can one day fabricate "rainbow" solar cells, which can efficiently harvest a large part of the useful spectrum of sunlight.

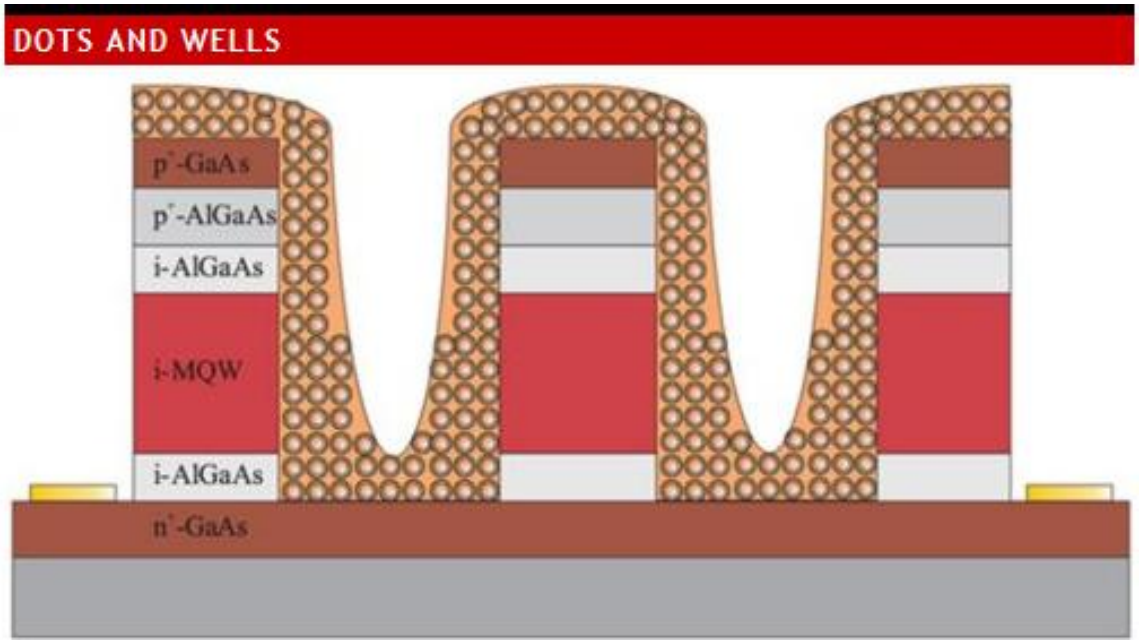
작은 반도체 크기의 양자점의 크기를 변화시켜서 연구자들은 태양전지 가 특정파장대의 빛을 흡수하도록 조절할 수 있다고 생각하고 있다. 즉, 더 작은 크기의 양자점을 사용하면 더 짧은 파장대의 빛을 흡수하며, 보다 큰 양자점은 더 긴파장의 빛을 흡수한다. 하나의 태양전지에 서로 다른 크기의 양자점을 조합하면 더 많은 빛을 흡수하는 태양전지 제작이 가능하고 따라서 일반 벌크 화합물 반도체에 비해 효율을 높일수 있을것으로 기대된다.

Quantum Dot Solar Cells. Tuning Photoresponse through Size and Shape Control of CdSe-TiO2 Architecture." *J. Am. Chem. Soc.* March 1, 2008. DOI: 10.1021/ja0782706.

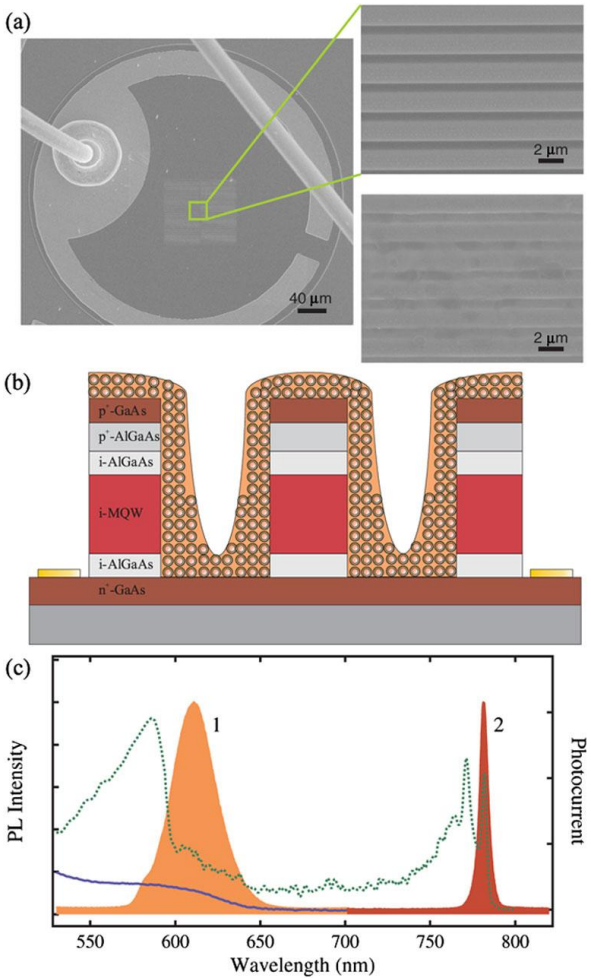
Hybrid Nanocrystal Quantum-Dot p-i-n Photovoltaic Devices

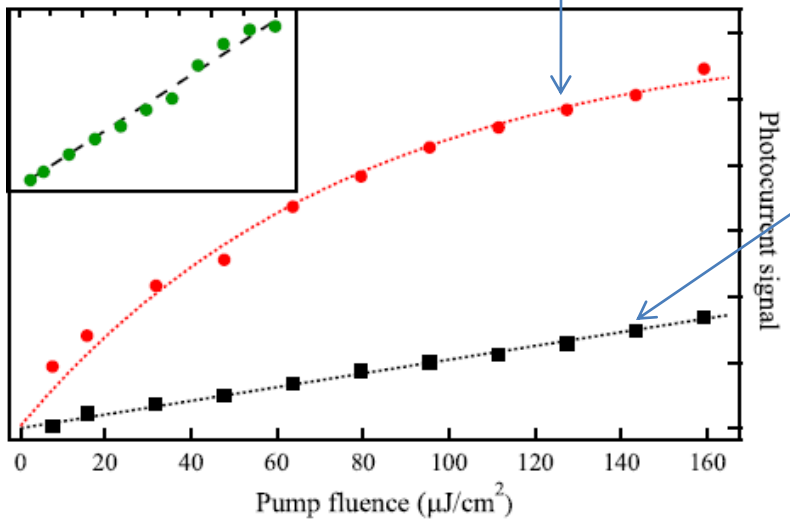
Quantum dots boost solar cell efficiencies Feb 27, 2009 physicsworld.com

Scientists in the UK and US have shown how to increase photovoltaic efficiencies by attaching nanocrystal quantum dots to patterned semiconductor layers. The approach exploits the phenomenon of non-radiative energy transfer and could, say the researchers, lead to a new generation of more efficient solar cells.



PRL 102, 077402 (2009)





A single p–n junction that are made from bulk semiconductor have a maximum theoretical efficiency of 31%.

One way scientists are trying to overcome this limit is to make cells from billions of tiny pieces of semiconductor known as quantum dots, rather than one large piece of semiconductor, because these can harness light more effectively and also can create multiple carriers from each incoming photon — a process known as "carrier multiplication".