sion energies observed in tetrapods, a surprising dependence on the excitation energy was observed, primarily in tetrapods exhibiting an overall PLE signature indicating uniform morphology. The researchers said that this phenomenon is due to misalignment of the CdSe and CdS conduction bands, which should be more pronounced in a system with more narrowly defined energy levels. Because both the CdSe core exciton energy and the CdSe/CdS interfacial exciton energy are observed in the emission spectra, the research team asserts that an interfacial barrier preventing complete transfer of the electron to the lowest energy conduction band exists.

The researchers conclude that uniformity of morphology is directly related to the uniformity of quantum confinement in the particles, and affects electronic delocalization across the heterojunction. Band misalignment is more prevalent in morphologically uniform particles, and there appears to be a barrier to electron transfer between CdS and CdSe in these cases.

The researchers suggest that nanostructures with uniform morphologies are desirable for light-emitting devices while those with some structural variation are more suited for light-harvesting applications because the barrier to electron transfer across the junction is less prevalent.

Alia P. Schoen

Bio Focus

Hydrogen-bonded shell enhances cell survivability

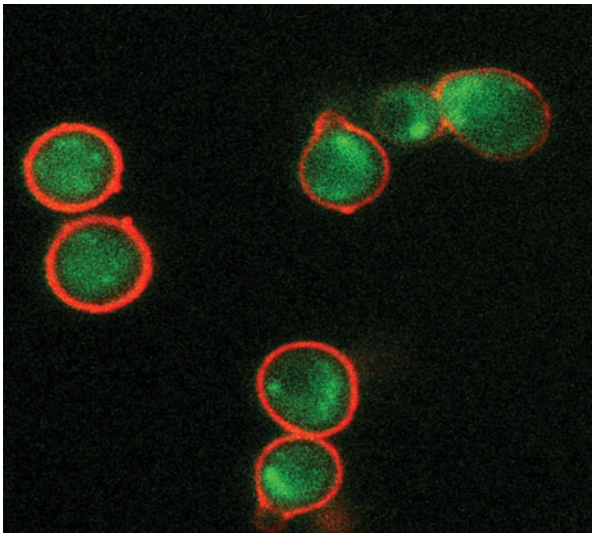
Modifying the surface of cells is a useful way of altering their functionality or protecting them from hostile environments. As living cells become increasingly exploited for uses in biomedicine and biosensing, the ability to tailor their external properties is of growing importance. In order to avoid the cytotoxicity of ionic polymer coatings, the groups of V. Tsukruk from the Georgia Institute of Technology and M. Stone from the Air Force Research Laboratory have developed a hydrogen-bonded layer-by-layer coating for genetically engineered yeast cells, which offers high permeability and biocompatibility.

The research, published in the 2011 online edition of *Soft Matter* (DOI: 10.1039/c0sm01070g), looks at yeast cells (*S. cerevisiae*) engineered to express green fluorescent protein (GFP) (see Figure). These cells can be used as biosensors, as the production of the fluorescent protein is triggered by certain inducer molecules. By dispersing them in aqueous solutions, the cells are coated in successive layers of poly (*N*-vinylpyrrolidone) and tannic acid, in which the hydroxyl groups of the acid form a hydrogen bond to the carbonyl groups of the polymer. The properties of the polymer membrane are assessed with respect to the number of bilayers applied and also compared with the commonly used polyelectrolyte cell coating poly(allylamine hydrochloride)/poly(styrene sulfonate) (PAH/PSS).

Using the resazurin assay to test cell viability shows that while three of the hydrogen-bonded bilayers cause only 20% cell death, the same number of traditional polyelectrolyte layers results in over 80%. The topography and permeability of the coatings are studied on hollow polymer shells formed by coating silica particles and then removing the interior. The surface of the tannic-acid/polymer structures appears grainy and porous in atomic force microscopy imaging, and correspondingly they have a much higher (up to five times) diffusion coefficient than PAH/PSS coatings. Most significantly, the new coating has very little adverse effect on the sensing functionality of the cells, in which fluorescence from GFP is increased dramatically by the introduction of galactose, whereas PAH/PSS layers cause almost complete suppression of it.

Using nontoxic and biocompatible molecules such as these is an unintrusive route to cell encapsulation, as is evidenced by the yeast's continued ability to bud new cells and reproduce. Not only do the porous hydrogen-bonded layers interfere very little with cell nutrition and sensing, they could also provide a way of adjusting membrane permeability with pH. The potential for environment responsive functionality will make these layer-by-layer membranes fertile ground for future cell modification research.

Tobias Lockwood



A confocal microscopy image of green fluorescing yeast cells (~5 μm) that have been coated with polymer shells (labeled for red fluorescence). Reproduced with permission from *Soft Matter* (2011) DOI: 10.1039/c0sm01070g. © 2011 Royal Society of Chemistry.

Correction

In the article by Browning et al. **35** (12)(2010) p. 1009, Figure 2 was devised and prepared by T. LaGrange at Lawrence Livermore National Laboratory as an extension of the previously published results cited in T. LaGrange, D.S. Grummon, B.W. Reed, N.D. Browning, W.E. King, G.H. Campbell, *App. Phys. Lett.* **94** (2009) 184101.