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# Polyelectrolyte-mediated assembly of multiwalled carbon nanotubes on living yeast cells.

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## Abstract

Here we report the three-dimensional assembly of carbon nanotubes on the polyelectrolyte-coated living Saccharomyces cerevisiae cells using the polyelectrolyte-mediated layer-by-layer approach. Synthetic polyelectrolytes poly(allylamine hydrochloride) and poly(sodium 4-styrenesulfonate) were layer-by-layer deposited on the surfaces of the yeast cells followed by the deposition of water-soluble oxidized multiwalled carbon nanotubes (MWNTs) and an additional outermost polyelectrolyte bilayer. This resulted in the fabrication of polyelectrolyte/nanotubes composite coatings on the cell walls of the yeast cells, which could be clearly seen using the conventional optical microscopy. Transmission and scanning electron microscopy was applied to further investigate the composite coatings. Viability of the encapsulated cells was confirmed using the intercellular esterase activity test. Finally, electrochemical studies using voltammetry and electrochemical impedance measurements were performed, indicating that the composite polyelectrolytes/MWNTs coatings sufficiently affect the electron mediation between the encapsulated yeast cells and the artificial electron acceptor, making it possible to distinguish between living and dead cells. The technique described here may find potential application in the development of microelectronic devices, core-shell and hollow composite microparticles, and electrochemical cell-based biosensors.

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