Electronic supplementary information

The adsorption of cytochrome *c* (CytC) and poly-D-lysine (PDL) molecules on the surface of gold nanoparticles (AuNP) has been verified by means of X-ray photoelectron spectroscopy (XPS) measurements. The XPS spectra were recorded by an Ultra Axis^{TM} spectrometer (Kratos Analytical, Manchester UK) using a monochromatic AlKα X-ray source (1486.6 eV). The sp3 hybridized C1s carbon (C-C, binding energy of 285 eV) was used to calibrate the energy scale with respect to charging. The spectral resolution defined as the full width at half maximum (FWHM) was better than 0.68 eV for the elemental spectra of carbon. The information depth is about 10 nm for polymers. The analysis of the recorded data was done by means of the UNIFIT software.

The XPS survey spectrum of the AuNP-modified Al-p-Si-SiO_2-MPTMS (3-mercaptopropyl trimethoxysilane) EIS sensor after adsorption of CytC and PDL molecules is demonstrated in Figure S1. For both CytC- and PDL-modified surfaces we observed a high content of Si, oxygen and Au, which originates from the sample substrate and the AuNP core, respectively. At the same time, both systems possess clear nitrogen N1s peaks. The high atomic concentration ratio of 7:3 and 5:3 N/Au after adsorption of CytC and PDL molecules, respectively, indicates the presence of a nitrogen-rich adlayer on the AuNPs. The CytC as well as PDL molecules consist of 10 to 20% nitrogen atoms, excluding hydrogen that cannot be detected by XPS. The high N/Au ratio suggests that the protein and polyelectrolyte layer decorates the AuNPs, resulting in an attenuated Au signal.

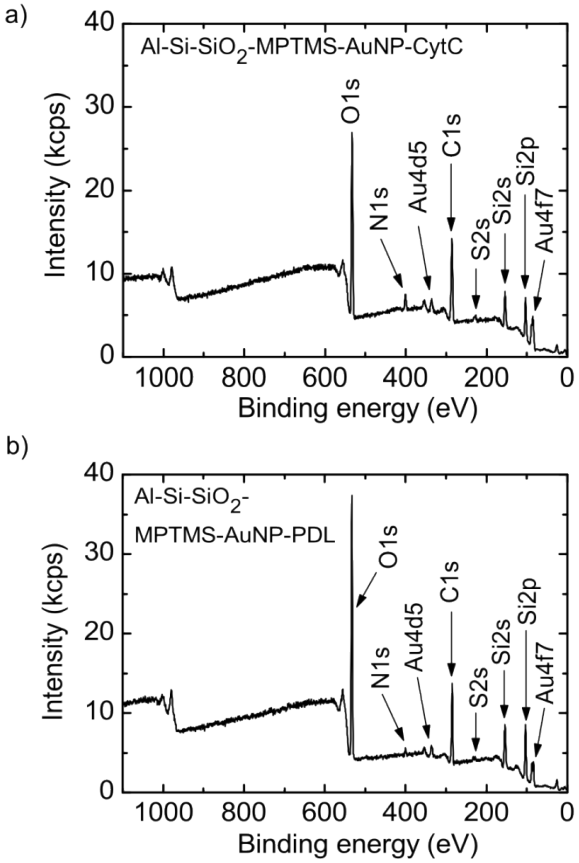

Figure S1. XPS survey spectrum of AuNP-modified Al-p-Si-SiO_2-MPTMS EIS sensor after adsorption of CytC (a) and PDL (b) molecules on the surface of AuNPs.