Electronic Supplementary Material (ESI) for Soft Matter

Supporting information

Molecularly imprinted conductive polymers for controlled trafficking of neurotransmitter at solid-liquid interfaces

N. Paul, M. Müller, A. Paul, E. Guenther, I. Lauermann, P. Müller-Buschbaum and M. Ch. Lux-Steiner

Contents:

I IR spectroscopy

When water is replaced by heavy water, the IR peak due to the bending vibrations of water at 1630 cm^{-1} get shifted to lower wavenumbers and the bending vibrations of the amine groups and the stretching vibrations of the carboxylate groups can be clearly seen. The shifting to lower frequencies is because the mass of attached deuterium atoms in heavy water is heavier than the mass of the attached hydrogen atoms in water and thus the bonds absorb at lower IR frequencies.

II X-ray photoelectron spectroscopy

Usually such a asymmetric broadening of the core level C 1s peak as shown in Fig. 4a is related to disorder[s1] and the high-energy part points towards either to the presence of C-O bonds which could be due to contamination on the surface or to photoemission from the C-N carbons.

A large chemical shift of the photoemission peak to 289 eV as shown in Fig. 4b has also been observed earlier due to carbon bonding to more than one oxygen in structures like N-C=O or O-C=O or formation of carbonyl bonds at carbon sites for imide carbonyl carbons[s2-s3]. The peak also contains a small contribution from the C-O bonds and the C-N bonds.

The lower binding energy shoulder seen in the N 1s spectra at 398.5 in Fig 4d is due to the aza-type nitrogen[s4] which forms as a result of deprotonation and rearrangement of the pyrrole bonds.

III Fluorescence spectroscopy on control PPy film

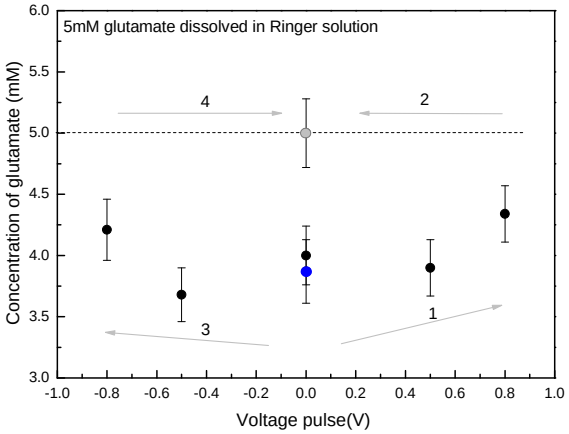

Figure S1: Changes in glutamate concentration calculated from the fluorescence intensities as a result of voltages applied to the control PPy (chlorine-doped-PPy) surface in Ringer's solution. The blue circle indicates the initial concentration and the grey circle denotes the initial concentration at the end of the cycle. The arrows define the sequence of the process.

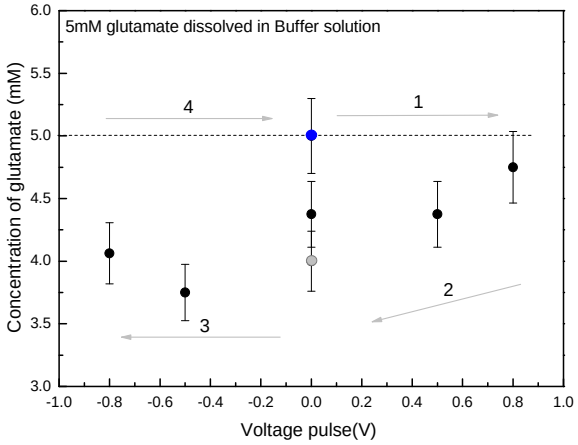

Figure S2: Changes in glutamate concentration calculated from the fluorescence intensities as a result of voltages applied to the control PPy (chlorine-doped-PPy) surface in buffer solution. The blue circle indicates the initial concentration and the grey circle denotes the initial concentration at the end of the cycle. The arrows define the sequence of the process.

The fluorescence experiments performed on PPy surfaces which are not imprinted with glutamate, i.e., the chlorine-doped PPy surface ***(control polymer film)***, show an erratic trend of change of glutamate with voltage as shown in Figure S1 and S2. This is expected as it is well known from literature on molecularly imprinted polymers[s5,s6] that a molecularly imprinted polymer doped a specific molecule during polymerization will only be able to modulate the uptake-release of that specific molecule. In our case, the specific molecule is glutamate for the glutamate-doped PPy surface and chlorine for the chlorine-doped PPy (the control PPy surface). Therefore the control PPy surface is not expected to show any specific trend of change of glutamate concentration in solution when voltage is applied to the control PPy surface.

IV References

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