1. The determination of the output voltage eliminated drift fraction and apparent equilibrium dissociation constants.

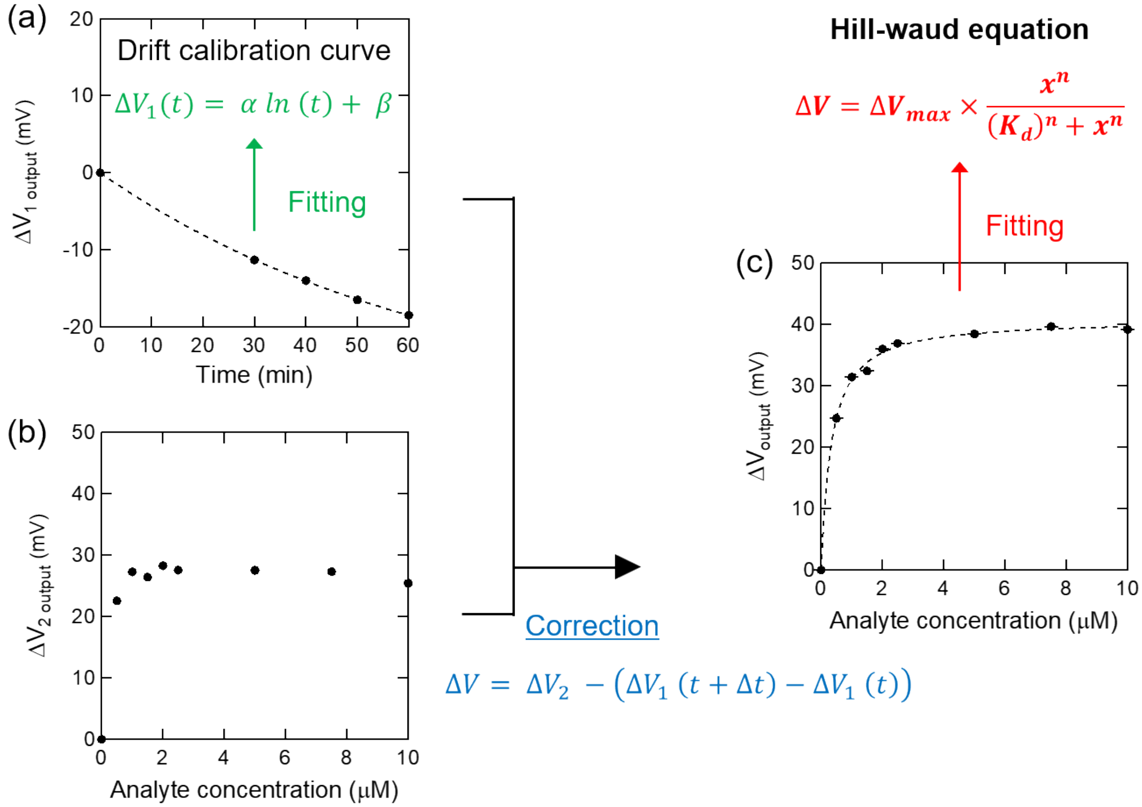

Fig. S1 (a) Time-dependent change in the voltage. The α and β in the drift calibration curve are fitting constants. (b) Change in the voltage depending on the analyte concentration. This voltage change is raw data without correction for drift fractions. (c) Change in the voltage corrected for drift fraction. This value is obtained by subtracting the data in (a) from that of (b). Additionally, the apparent equilibrium dissociation constant (K_d) is calculated by fitting the data in (c) using the Hill-waud equation, where ΔV_{max} is the maximum voltage when analyte completely saturate the SAM surface, *x* is the analyte concentration, and *n* is the Hill coefficient of cooperativity.

2. XPS peak separation analysis in the S 2p region to evaluate the nanostructure of the SAMs.

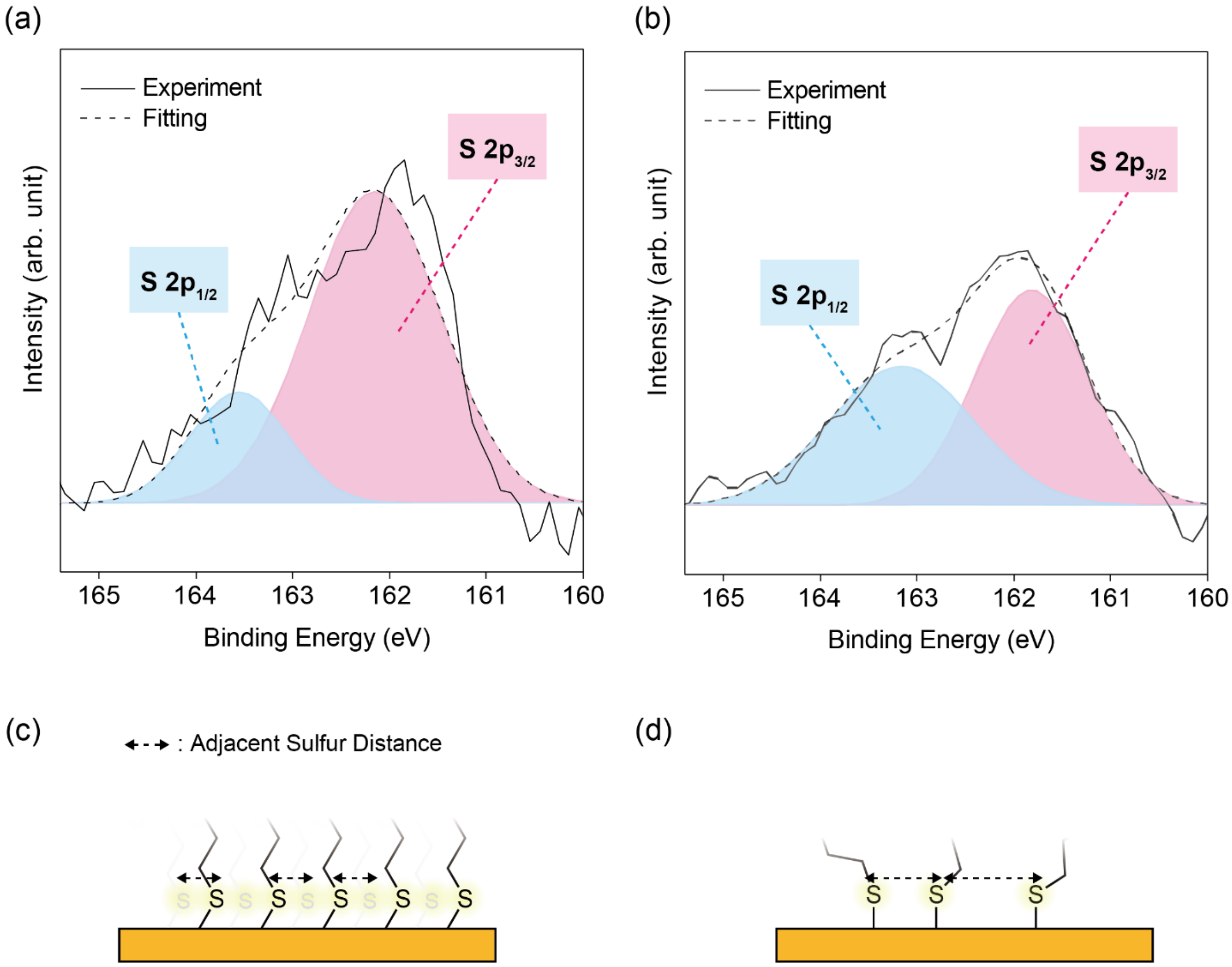

Fig. S2 (a, b) XPS spectra in the S 2p region on the 3-MPA-SAM (a) and 2-MEA-SAM (b). The fitting and separation analyses for the obtained XPS peak were carried out on the Common Data Processing System (COMPRO) 12 software. (c, d) Schematic illustration of the nanostructure in the 3-MPA- (c) and 2-MEA- (d) SAMs. The expected nanostructure of the SAMs was illustrated based on the obtained results of each surface characterization (XPS, PYSA, and QCM).

3. Possible image of charges of self-assembled monolayers.

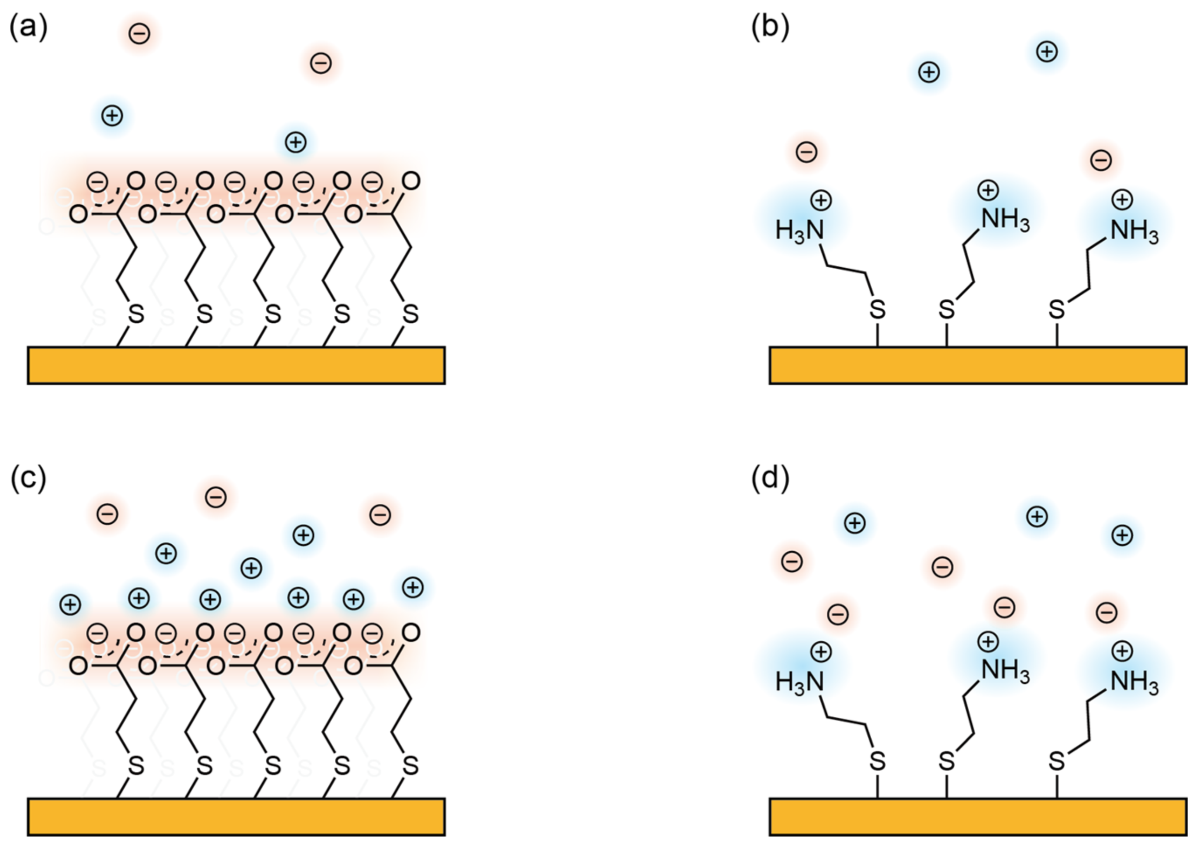

Fig. S3 Possible illustrations of charges of each SAM with (a,b) 1 mM electrolyte or (c,d) 10 mM electrolyte.