Supporting Information

Artificial muscles: a tool to quantify exchanged solvent during biomimetic reactions.

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The relationship between the curvature of the bilayer and the angle described by the muscle under flow of increased specific charges (Eq. 4 from the main text) was checked and represented in Figure S1.

![Graph showing the linear relationship between the angles described by flow of increasing specific charges and the difference between the initial and final curvature for each charge of the pPy/tape bilayer artificial muscle. The experiments were performed by flow of a constant current of 1 mA through the muscle in 0.5 M NaClO$_4$ aqueous solution for different times starting every time from the same initial position.]

Figure S1: Linear relationship between the angles described by flow of increasing specific charges and the difference between the initial and final curvature for each charge of the pPy/tape bilayer artificial muscle. The experiments were performed by flow of a constant current of 1 mA through the muscle in 0.5 M NaClO$_4$ aqueous solution for different times starting every time from the same initial position.

The angular displacement of any artificial muscles is defined by the applied charge (Eq. 6 from the main text). This faradic relationship is kept for experiments performed in different concentrations of electrolyte (figure S2).
Figure S2: Angle described by a polypyrrole/tape bilayer in different concentrations of NaClO₄ aqueous solutions. The displacement was repeated by consumption of 30 mC every time under flow of 0.5, 1, 1.5 and 2 mA during the required time (q = it).

The angular rate of the bending movement of the artificial muscle is a linear function of the applied specific current in each of the studied electrolytes. The slope is a characteristic of every electrolyte (crystallographic radius of the anion and number of exchanged solvent molecules per involved charge), figure S3.

Figure S3: Angular rates measured from a bilayer polypyrrole/tape as a function of the specific applied current (per milligram of active polypyrrole) by flow of different constant currents (0.25, 0.50, 0.75, 1.00,
1.25, 1.50, 1.75, 2.00, 2.25 and 2.50 mA) through the artificial muscles in 0.5 M aqueous solutions of the studied electrolytes. Dispersions were obtained by flow of different charges: every time passing a constant specific current and changing the time of current flow.