Electronic supplementary information for

Energy harvesting by ambient humidity variation with continuous milliampere current output and energy storage

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Preparation of hygroelectric cell (HEC)

The body of the HEC was made of laser-cut acrylic board. A self-bonding tape (4600HDBK-50-10, Tesa, Germany) was used as the gasket. Neosepta CSE and ASE membranes were stored in 20 wt% aqueous LiCl solution or 30 wt% aqueous $CaCl_2$ solution before the experiments to exchange counterions and maximise swelling. The Nafion 117 membrane was stored in deionised water before the experiments to maximise swelling. Photographs of the parts and the assembled HECs are shown in Fig. S1.

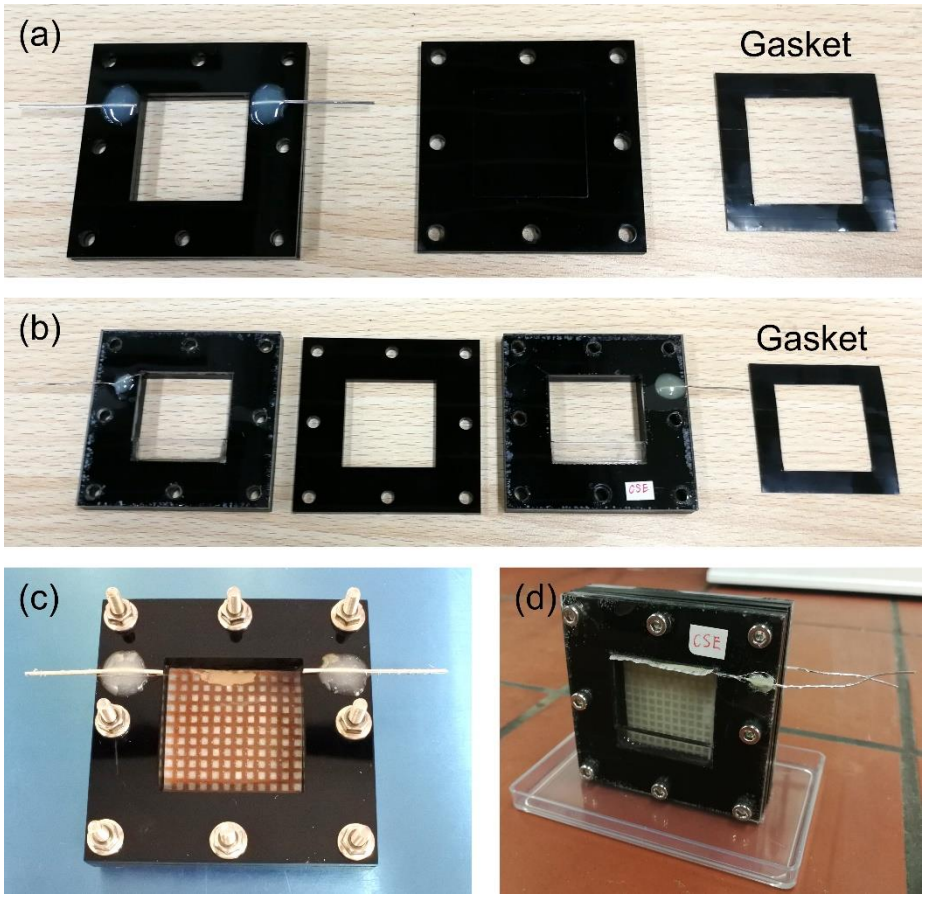

Fig. S1 Photos of the hygroelectric cells. Parts of the (a) two- and (b) three-compartment cells and (c, d) corresponding assembled cells, respectively.

Typical humidity transition in the chamber

The typical humidity transition in the constant temperature and humidity chamber (PR-1J, ESPEC, Japan) used in the experiments is shown in Fig. S2.

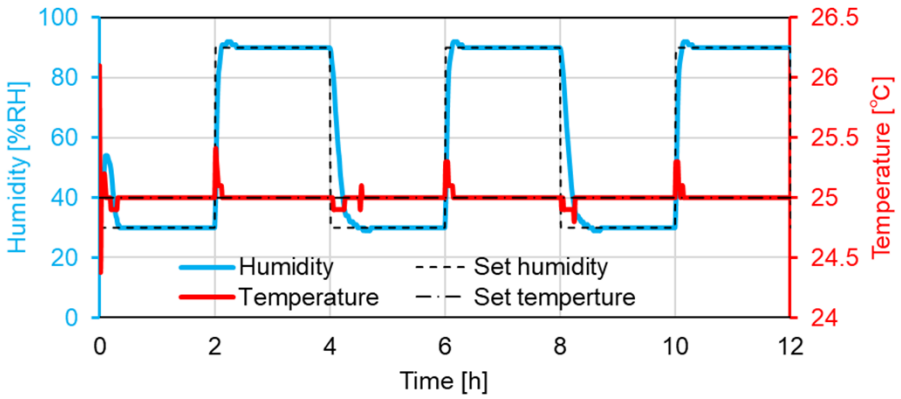

Fig. S2 Humidity transition in the constant temperature and humidity chamber.

Ultralow-power motor

The structure of the ultralow-power motor is shown in Fig. S3. This motor utilises a magnetic reed switch (RI-80, Assemtech, UK) to modulate the current through a coil. A 0.1-F capacitor was connected to the motor in parallel as an accumulator, which boosts the power of the motor by absorbing the electricity from the power supply when the reed switch is open and discharging it when the switch is closed. This motor could run on a power below 10 µW owing to the small friction.

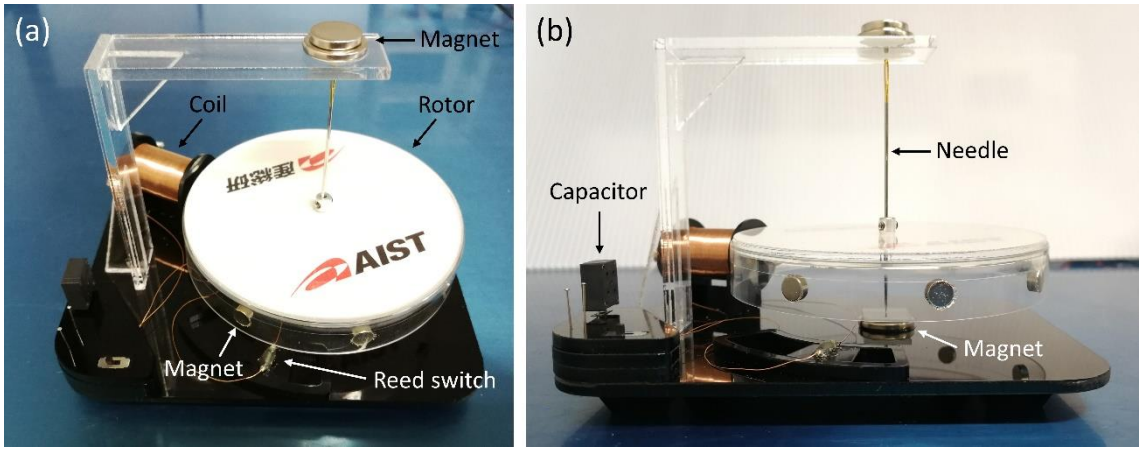

Fig. S3 (a) Angled and (b) side views of the ultralow-power-motor used in the experiment.