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Supplemental Figure 1: V-I results show a non-stable impedance of the pump.

In this work, the power source provides DC voltage output, the current passing through the pump can be measured accordingly. The impedance of the pump varies according the applied voltage, in the other word, the current does not increase linearly with the applied voltage. We did another measurement to demonstrate the impedance of the pump and have included this material as Supplemental figure 1.



Supplemental Figure 2: SEM images of the Pt coated carbon fiber surface after used. Catalytic reformers were used for 10 actuation cycles with each actuation period of 1 minute under a power of 2.4 mW.

After 10 cycles (the period of each actuation is 1 minute, the applied power is 2.4 mW), the surface of the catalytic reformer is unchanged (Fig.2 in the manuscript shows the SEM images before use), its SEM images after use have been included as Supplemental Figure 2. Both carbon fiber and platinum are inert materials that do not interact with DI water, so corrosion or degradation should not happen on the surface of the catalytic reformer.