

## Development of Non-gassing Electroosmotic Pump and Its Application for Drug Infusion System

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I have enjoyed developing non-gassing electroosmotic pump with Adam from 2009. The most of the electroosmotic pumps use platinum electrodes and the pumped solution keeps being electrolyzed to produce O<sub>2</sub> from anode and H<sub>2</sub> from cathode. For the continuous pumping the continuous electrochemical reaction is essential and the trapped bubbles in the MEA block the fluid movement, making the flow irregular. Even the co-production of O<sub>2</sub> and H<sub>2</sub> makes the system unsafe in the closed loop. We substituted the platinum electrode to Ag/Ag<sub>2</sub>O electrode and enabled the pump operation without gassing. The 8 mm diameter, 2 mm thick pump operates at 5 - 40 μL min<sup>-1</sup> upon applying 0.3 - 2.0 V. The resulting efficiency of the pump is 14,000 water molecules pumped per reacted electron.<sup>1</sup> It is made of only 2.3 coulombic amount of Ag/Ag<sub>2</sub>O deposited consuming electrodes and provides continuous operation for 3 hours at 20 μL min<sup>-1</sup> flow rate at 1 V; or pulsed operation for 30 sec every 30 min for 70 hours; or daily operation for 5 min for 1 month.<sup>2</sup> The pump was applied in a miniature (36 x 30 x 8 mm), single-use, subcutaneous drug infusion system.<sup>3</sup> Further developments and possible biomedical applications of the pump will be discussed in detail.

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### References

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