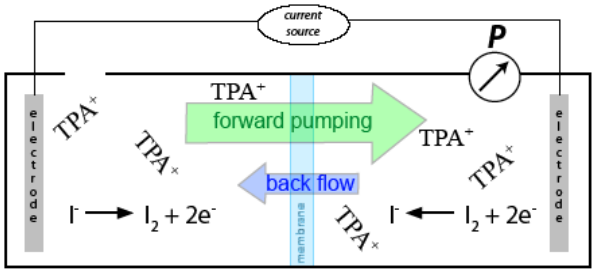
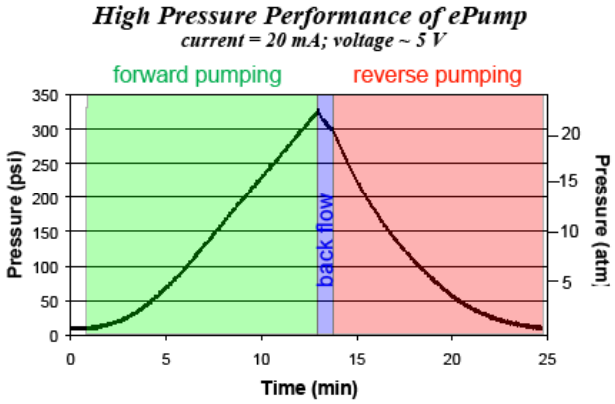
Non-Mechanical Pumping: *em-Pump*

Non-mechanical pumping of liquids is of key interest for applications ranging from biomedical lab-on-a-chip systems to morphing mechanical structures. Researchers at the University of Colorado have developed a pumping and pressurization system with no moving parts that uses modest level of external power. Pressures up to 23 atm have been demonstrated using this ***em-Pump*** (membrane based) system.





Electrochemical reactions are used to create a charge imbalance across an ionomer membrane. The mobile cation within the solution then migrates across the membrane to balance the charge, transporting solvent molecules with it. In this modified version of facilitated transport, the solvation shell of the ion appears to play a key role in the volume transport and the pressurization processes.

Pumping efficiency of the unoptimized ***em-Pump*** prototype compares favorably with the reported values of electroosmotic (aka electrokinetic) pumps. The pressure/potential figure of merit often cited in the literature is significantly higher for the ***em-Pump*** than that reported for other micropump systems. The pressure/potential figure of merit yields a value of 4.0 atm/V for the prototype tests

Advantages of the ***em-Pump*** technology include:

- no moving parts
- operates with low power
- pumping and pressurization rates are controlled by cell current
- size and output scaleable
- uses aqueous or non-aqueous solvents.

Applications of the ***em-Pump*** include:

- micro-fluidics
- activation of morphing structures
- adaptable structures.

Carl Koval, PhD; Christine Evans, PhD and Richard Noble, PhD are the lead ***em-Pump*** innovators. For additional information please contact Liza Eschbach at 303-735-6165 or liza.eschbach@cu.edu