
# Michael J. Aziz

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Michael Aziz received a B.S. from Caltech in 1978 and a Ph.D. in Applied Physics from Harvard in 1983. He spent two years at Oak Ridge National Laboratory as Eugene P. Wigner Postdoctoral Fellow. He has been a member of the faculty at what is now the Harvard John A. Paulson School of Engineering and Applied Sciences since he joined in 1986 and is now Gene and Tracy Sykes Professor of Materials and Energy Technologies.

His recent research interests include novel materials and processes for energy technology and greenhouse gas mitigation. He is co-inventor of the organic aqueous flow battery and directs a multi-investigator research program on stationary electrical energy storage. He is the Faculty Coordinator for Harvard's University-Wide Graduate Consortium on Energy and Environment, for which he developed a quantitative course on Energy Technology for a group of students in diverse disciplines. He is authoring a textbook, "Introduction to Energy Technology: Depletable and Renewable", to be published by Wiley-VCH.

## *Organic Aqueous Flow Batteries for Massive Electrical Energy Storage*

*Abstract*

The ability to store large amounts of electrical energy is of increasing importance with the growing fraction of electricity generation from intermittent renewable sources such as wind and solar. Flow batteries show promise because the designer can independently scale the power (electrode area) and energy (arbitrarily large storage volume) components of the system by maintaining all electro-active species in fluids. Wide-scale utilization of flow batteries is limited by the abundance and cost of these materials. We have developed an approach to electricity storage in flow batteries using the aqueous redox chemistry of small, inexpensive organic and organometallic molecules. This new approach may enable massive electrical energy storage at greatly reduced cost.

References

- http://aziz.seas.harvard.edu/electrochemistry
- B. Huskinson, M.P. Marshak, C. Suh, S. Er, M.R. Gerhardt, C.J. Galvin, X. Chen, A. Aspuru-Guzik, R.G. Gordon and M.J. Aziz, "A metal-free organic-inorganic aqueous flow battery", *Nature* **505**, 195 (2014), http://dx.doi.org/10.1038/nature12909
- K. Lin, Q. Chen, M.R. Gerhardt, L. Tong, S.B. Kim, L. Eisenach, A.W. Valle, D. Hardee, R.G. Gordon, M.J. Aziz and M.P. Marshak, "Alkaline Quinone Flow Battery", *Science* **349**, 1529 (2015), http://dx.doi.org/10.1126/science.aab3033
- K. Lin, R. Gómez-Bombarelli, E.S. Beh, L. Tong, Q. Chen, A.W. Valle, A. Aspuru-Guzik, M.J. Aziz, and R.G. Gordon, "A redox flow battery with an alloxazine-based organic electrolyte", *Nature Energy* **1**, 16102 (2016). http://dx.doi.org/10.1038/nenergy.2016.102
- E.S. Beh, D. De Porcellinis, R.L. Gracia, K.T. Xia, R.G. Gordon and M.J. Aziz, "A Neutral pH Aqueous Organic/Organometallic Redox Flow Battery with Extremely High Capacity Retention", *ACS Energy Letters* **2**, 639 (2017). http://dx.doi.org/10.1021/acsenergylett.7b00019

**Tuesday May 2nd, 2017 | 2112 Learned Hall | 10:00 – 10:50AM**