An uncommon influence for a research paper

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(PhysOrg.com) -- An article written in 2004 by a Lehigh engineering professor and his former student has received more citations than any publication in its field, according to a company that analyzes the influence of research papers.

Titled “A microreactor for hydrogen production in micro fuel cell applications” and authored by Mayuresh Kothare and Ashish Pattekar, the paper was featured this week as a “Fast Moving Front” article by Thomson Reuters Science Watch.

The article, published in IEEE’s *Journal of Microelectromechanical Systems* in February 2004, was named by Thomson Reuters this week as “the most cited paper in the research area of micro fuel cell applications.”

Kothare is the R.L. McCann Professor of chemical engineering. Pattekar, who received his Ph.D. from Lehigh in 2004, is a researcher with the Palo Alto Research Center Inc. in Palo Alto, Calif.

A citation occurs when a published research article is referenced by a subsequent article. It is considered one of the most significant measures of an article’s influence. The paper by Kothare and Pattekar has been cited 97 times.

A possible new power source for portable electronics

The paper describes one of the earliest attempts to integrate a chemical

reactor on a silicon chip for micro fuel cell applications. The cells possess energy storage densities potentially 10 times greater than those of existing rechargeable batteries and are thus being considered as alternative power sources for portable electronics.

The fuel cell envisioned by Kothare and Pattekar uses hydrogen as a fuel to produce electricity. Supplying the hydrogen is a problem as elemental hydrogen is extremely difficult to carry and store in pure form in sufficient quantities.

Kothare and Pattekar demonstrated that a microreactor could chemically convert liquid methanol to hydrogen on an as-needed basis and in quantities that exceed by 10 times the amounts generated by other storage methods. They developed and fine-tuned leak-proof fluid channels and on-chip heaters and temperature sensors for the fuel cell and minimized energy consumption with computer simulations.

“A reformed hydrogen fuel cell could provide an order-of-magnitude increase in energy storage density over today’s batteries,” the researchers say. This in turn, they add, could enable laptop computers to run eight to 10 times longer than they do now with existing rechargeable batteries. It could also reduce from 40 pounds to less than five pounds the weight of the batteries carried by soldiers equipped with on-person electronics.

Kothare received initial funding for the research in 1999 from the National Science Foundation. He and Pattekar are seeking funding to combine their fuel reformer with a micro fuel cell.

“We certainly expect this work to eventually lead to the ‘power source of the future’—one that lasts many times longer than today’s batteries, and enables a ‘truly wireless’ world where portable devices do not have to be plugged into a power outlet so often,” the researchers said.

Provided by Lehigh University