Massachusetts Institute of Technology

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Case 14771

Portable Pneumatic Battery: Chemical Power Generation for Fluidic Elastomer Actuators

Keywords:

Soft robotics, fluidic elastomer actuators, chemical pressure generation, distributed actuation, smart materials

Applications:

Convert chemical energy to mechanical energy for use in robotics, wearable tactile interfaces, and active orthoses or prostheses.

Problem:

Fluidic actuators require a pressure source, which limits their mobility and mainstream usage.

Technology:

This invention uses a chemical approach to achieve portable and silent pressure generation. It specifically focuses on on-demand pressure generation by mechanical self-regulation of decomposition of hydrogen peroxide (H2O2) into oxygen (O2). Another key feature is its rotation-invariant usage, which allows the battery to operate in any orientation.

Advantages:

- Portable and silent pressure generation
- Green/ Clean technology: No emissions or harmful byproducts.
- High energy density: Pure H_2O_2 has a theoretical energy density of 2.7 kJ/g. The energy density of our peroxide solution is comparable to Lithium batteries.
- Oxygen generation: In addition to pressure, oxygen can be stored and transported with our device. This eliminates the need for high pressure tanks, but can still offer high oxygen density.

Inventors:

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Intellectual Property:

US Provisional Patent 61/479529 filed April 27, 2011

Publications:

Cagdas D. Onal, Xin Chen, George M. Whitesides, and Daniela Rus. Portable pneumatic battery: Chemical power generation for fluidic elastomer actuators. PNAS 1-6 [2011]. Doi:10.1073/pnas.0709640104

Related Cases:

14017: Pulse-modulated control, non-linear friction, micron-scale valves, actuators (http://web.mit.edu/tlo/www/techbrief/14017TechBrief.html)

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