Electrically Activated Shape Memory Ceramics
Technology #16618

Applications

Applications for solid state electrically activated actuators with large strains include: micro-robotics, haptics-tactile interfaces, electronics-camera auto-focus mechanisms, micro and nano positioning, fuel injector actuation.

Problem Addressed

Previous actuators such as shape memory metals or piezoelectrics do not provide large mechanical displacements via direct electrical activation. This invention creates the possibility to actuate a phase transformation with a large mechanical displacement using an electric field.

Technology

This technology is based on the principle that for any phase transformation to occur there must exist a difference in an extensive variable between the two phases. These materials (e.g., ceria-doped zirconia) exhibit a change polarization between phases, which has not been demonstrated before. This allows the material to produce a mechanical displacement when subject to an electric field. The simplest implementation of this type of actuator would resemble a parallel plate capacitor with a layer of active ceramic material between to conductive electrodes. Then a voltage could be applied across the material which would induce an electric field and cause the material to actuate.

Advantages

- Actuation due to an electric field
- Improved cyclic properties

Related Technologies

Electrically Activated Shape Memory Ceramics is connected to Shape Memory and Pseudoelastic Ceramics (15550)

Categories For This Invention:

Materials
Micro & Nanotech
Shape Memory Alloy Structures
Robotics
Actuators
Shape-memory Effect Actuators

Intellectual Property:

Electric field activation of shape memory ceramics
Issued US Patent
9,548,678
Electric field activation of shape memory ceramics
Issued US Patent

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Publications:

Shape Memory and Superelastic Ceramics at Small Scales
Science
September 27, 2013

External Links:

Schuh Group
https://schuh.mit.edu/

Image Gallery: