



## **Giant Electrostriction in highly defective oxides: The next generation of electromechanical materials.**

**Santucci, Simone; Esposito, Vincenzo; Pryds, Nini**

*Published in:*

Book of Abstracts, Sustain 2017

*Publication date:*

2017

*Document Version*

Publisher's PDF, also known as Version of record

[Link back to DTU Orbit](#)

*Citation (APA):*

Santucci, S., Esposito, V., & Pryds, N. (2017). Giant Electrostriction in highly defective oxides: The next generation of electromechanical materials. In Book of Abstracts, Sustain 2017 [M-20] Technical University of Denmark (DTU).

## **DTU Library**

Technical Information Center of Denmark

---

### **General rights**

Copyright and moral rights for the publications made accessible in the public portal are retained by the authors and/or other copyright owners and it is a condition of accessing publications that users recognise and abide by the legal requirements associated with these rights.

- Users may download and print one copy of any publication from the public portal for the purpose of private study or research.
- You may not further distribute the material or use it for any profit-making activity or commercial gain
- You may freely distribute the URL identifying the publication in the public portal

If you believe that this document breaches copyright please contact us providing details, and we will remove access to the work immediately and investigate your claim.

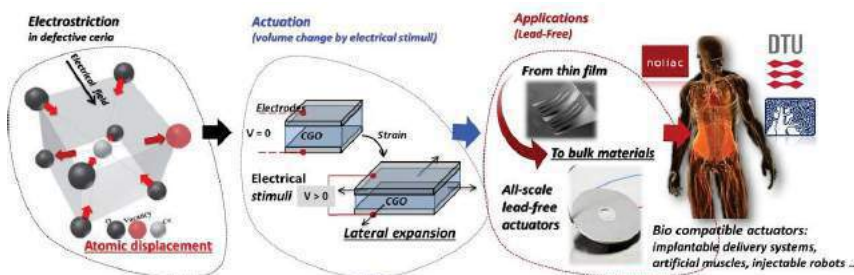
## Giant Electrostriction in highly defective oxides: The next generation of electromechanical materials.

Simone Santucci<sup>1\*</sup>, Vincenzo Esposito<sup>1</sup>, Nini Pryds<sup>1</sup>.

1: Department of Energy Conversion and Storage, Technical University of Denmark, Frederiksborgvej 399, Roskilde 4000, Denmark.

\*sisan@dtu.dk

'Smart' materials such as piezoelectric or electrostrictive materials, which change their shape in response to external fields, are deployed in a wide range of sensing and actuating applications, including consumer electronics, robots and automotive systems. For these reasons, Giant Electrostriction effect (Giant-E) in rare earth doped cerium oxide is one of the most fascinating discoveries in materials science in recent years. Scientists at the Weizmann Institute of Science (WIS), partners of this project, reported that thin films of Gd-doped Ceria ( $Ce_{1-x}Gd_xO_{2-\delta}$ , CGO), exhibit an exceptionally high electrostrictive response even under moderate electric field. At present, the most widely used electrostrictor materials contain lead (Pb) which is highly toxic and restricted by the European RoHS directive. CGO, in other hand, contains no hazardous elements, opening further possibilities to develop environmental friendly devices, also for biomedical applications.



Despite this great potential, so far only CGO thin films with a specific textured microstructure have been found to be electromechanically active. With this in mind, the scientific aim of the GIANT-E project is to unveil the inner mechanism governing the electrostriction effect in these materials, and extend such property to the bulk form. The technological aim is to stabilize the electrostriction effect in thick samples, for a new paradigm of lead-free electromechanical active materials.