

Ferroelectric polarization in nanocrystalline hydroxyapatite thin films on silicon.

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Rok wydania

2013

Czasopismo

Scientific Reports

Numer woluminu

3

Strony

2215/1-2215/6

DOI

10.1038/srep02215

Kolekcja

Naukowa

Język

Angielski

Streszczenie

Hydroxyapatite nanocrystals in natural form are a major component of bone- a known piezoelectric material. Synthetic hydroxyapatite is widely used in bone grafts and prosthetic pyroelectric coatings as it binds strongly with natural bone. Nanocrystalline synthetic hydroxyapatite films have recently been found to exhibit strong piezoelectricity and pyroelectricity. While a spontaneous polarization in hydroxyapatite has been predicted since 2005, the reversibility of this polarization (i.e. ferroelectricity) requires experimental evidence. Here we use piezoresponse force microscopy to demonstrate that nanocrystalline hydroxyapatite indeed exhibits ferroelectricity: a reversal of polarization under an electrical field. This finding will strengthen investigations on the role of electrical polarization in biomineralization and bone-density related diseases. As hydroxyapatite is one of the most common biocompatible materials, our findings will also stimulate systematic exploration of lead and rare-metal free ferroelectric devices for potential applications in areas as diverse as *in vivo* and *ex vivo* energy harvesting, biosensing and electronics.

Słowa kluczowe

bioenergetics, biomedical materials, biomineralization, biophysical methods

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Typ publikacji

Adres publiczny

Artykuł

<http://dx.doi.org/10.1038/srep02215>

Plik został wygenerowany dnia 2026-05-14 14:34:08

Adres w repozytorium <https://old.chem.uni.wroc.pl/pl/repozytorium/uLLj6Xy>.