TECHNOLOGY

Device based on Super Pyroelectricity

OVERVIEW

Background

Pyroelectricity is the ability of certain materials to generate an electrical potential when heated or cooled.Pyroelectric infrared detectors are used in surveillance and motion detection systems that require low cost and power consumption. The operation of pyroelectric detectors is based on measuring the current generated in a pyroelectric material in response to temperature variations. The figure of merit for detector applications is the ratio between the pyroelectric coefficient and the dielectric constant. Usually in the temperature range, in which the pyroelectric coefficient is large, the dielectric constant is also large. Therefore, stabilizing the temperature of the detector, so that the pyroelectric coefficient is at its maximum is not practical, because it leads to large power consumption in exchange to a very moderate increase of sensitivity.

New Invention
Researchers at the University of Maryland and the Weizmann Institute of Science have created a pyroelectric material that combines large pyroelectric coefficient and relatively low dielectric constant. The invention is based on the recently discovered phenomenon of self-organization of ferroelectric nanocrystalline grains into polycrystalline macro-domains. As a result, a thin film comprising of ferroelectric grains splits spontaneously into the regions, within which the directions of the polar axes of the grains become spontaneously correlated. In response to temperature variations, some of the ferroelectric grains undergo so-called 90-degrees polarization switching and therefore produce pyroelectric current, which is 10-100 times larger than the current that could be generated in a single crystal of the same material in similar conditions.

Applications
The invention may be used to produce infrared detectors in a form of single units and detector arrays (focal plates). Detectors using the films with polycrystalline domains may effectively operate till the frequency of 105 Hz and withstand large accelerations (few g's), which may be particularly useful for mobile systems. The detectors can be constructed to operate within large temperature range (-10+50 degrees Celcius) without temperature stabilization.

Patent Status: Pending

For additional information please contact either the University of Maryland Technology transfer office, 301-405-2555 or at otc@umd.edu.

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Additional Information

INSTITUTION

University of Maryland, College Park

PATENT STATUS

Patent(s) pending

LICENSE STATUS

Contact OTC for licensing information

CATEGORIES

- Chemical

EXTERNAL RESOURCES

- US Patent 8,419,984

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