

<div class="df_qntext">Can ferroelectric materials be used in solar energy devices?

Here, the charge transportation is not limited by diffusion, and V_{oc} is not restricted to the energy barrier (energy band gap). Exploitation of suitable ferroelectric materials having narrow-band gap useful for visible region are promising for their potential application in both novel optoelectronic and the solar energy devices.

6.1. Overview

<div class="df_qntext">What is a ferroelectric material?

If a material exhibits ferroelectric effects in one polar direction, and antiferroelectric effects perpendicular, it may be termed ferroelectric. Perovskite is a naturally occurring mineral with chemical formula $CaTiO_3$. This is a prototype for many ABO_3 materials which are very important in ferroelectrics.

<div class="df_qntext">What is ferroelectric PV?

The field of ferroelectric PV is evolving and not yet completely understood compared to the semiconductor-based PV technology. PV materials and devices, commonly known as solar cells, convert sunlight into electrical energy. Generation of electricity in a clean, quiet, and reliable way is one of the major attractions of PV technology.

<div class="df_qntext">Does a ferroelectric material exhibit a spontaneous polarization below a Curie temperature?

Ferroelectric materials exhibit a spontaneous polarization below a Curie temperature, above which they become paraelectric. The crystal structure of a material determines whether it can exhibit ferroelectricity. Of the 20 non-centrosymmetric crystal classes, 10 have a unique polar axis enabling spontaneous polarization.

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<div class="df_qntext">What is the ferroelectric photovoltaic effect?

To overcome these limitations, another mechanism was discovered in noncentrosymmetric materials, such as ferroelectrics and is called the ferroelectric photovoltaic effect (FE-PV), which differs from the conventional junction-based interfacial PV effect in semiconductors, such as p-n junction or Schottky junction.

<div class="df_qntext">Why is FE-PV a renaissance in ferroelectric materials?

However, owing to small current densities of the order of nanoamperes/cm² due to large band gap in the ferroelectric materials, the PV efficiency was limited. The existence of photovoltage higher than the band gap in thin films of Bismuth ferrite ($BiFeO_3$) has led to a renaissance of research in PV ferroelectric materials (FE-PV).

To study the ferroelectric photovoltaic effect based on polycrystalline films, preparation of high-quality polycrystalline films with low leakage and high remnant polarization is essential. Polycrystalline ...



Ferroelectric solar container ppt

This study strongly suggests that domain-engineered ferroelectric materials can be used as effective charge separation and collection layers for efficient solar water-splitting photoanodes.

For high power ferroelectric systems based on stress-induced depolarization of ferroelectric materials, the highest surface charge density that can be released by a ferroelectric ...

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The solar blindness of the electrode enables a record-breaking bulk photovoltaic effect (BPE) with white light illumination (general use indoor light). This work opens up the perspective of ferroelectric ...

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These ferroelectric solar cells have been proposed to utilize the polarization electric field to drive the charge separation and transport. Ferroelectric polarization electric field has also been ...

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