SCHOLARLY PUBLICATIONS
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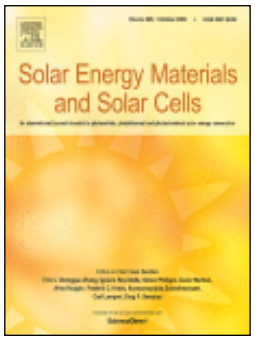
Journal Name: Solar Energy Materials and Solar Cell **IF: 6.6**

Title: Beyond lead halide perovskites: visible light photovoltaics with phase engineered bismuth-based oxide double-perovskites, Bi2MCrO6 (M = Fe, Mn)

Author: Vikas N.P.; Pradhan R.K.; Mukherjee S.; Singh U.P.; Patra B.K.; Srivastava R.P.; Roy A.

Details: Volume 306, October 2026

Abstract: Lead poisoning and notorious ambient instability in lead-based halide perovskites pave the way for the exploration of alternative materials for affordable and efficient solar cell fabrication. An important prerequisite to this end is the optoelectronic evaluation of the proposed material. Here we report, optoelectronic characterization of Bi_2FeCrO_6 (BFCO) and Bi_2MnCrO_6 (BMCO) thin films vis-à-vis performance of photovoltaic cells. Solution-deposited thin films (350-450 nm) of the above compositions demonstrate a double-perovskite structure with monoclinic P 2_1/ c symmetry, albeit with mixed cation valences and deep-level defects. A thorough optoelectronic evaluation exhibits large optical absorption in the visible range ($\alpha \sim 10^4$ -$10^5 cm^{-1}$), and high carrier density, $\sim 10^{17-20}$ cm^{-3}. Ultraviolet photoelectron spectroscopy measurement allowed determination of the positions of the band-edges (valence band maximum and conduction band minimum), required for the selection of carrier transport layers. In its first, BMCO-based FTO/SnO_2/BMCO/Spiro-OMeTAD/Ag solar cell produced a maximum 3.56% conversion efficiency. Using numerical simulation, we predict that with suitable defect control, the above conversion efficiency can increase significantly.



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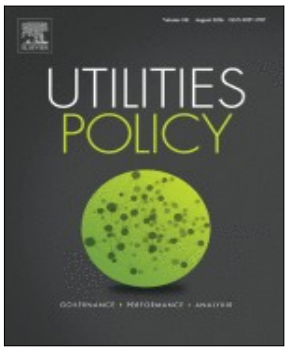
Journal Name: Utilities Policy **IF: 4.9**

Title: Analyzing the evolution of India's electricity market: A systematic review of drivers, barriers, and regulatory instruments

Author: Sahoo, S; Mishra, S; Mishra, DK

Details: Volume-102, 26th October, 2026

Abstract: The global transition toward sustainable power systems, energy security, and economic growth has increased the importance of modern electricity markets worldwide. In India, the electricity sector has undergone a significant transformation since the implementation of the Electricity Act, 2003, shifting from a vertically integrated structure to a more competitive, market-oriented framework. The increasing penetration of renewable energy, rising electricity demand, and continuous regulatory reforms have accelerated the development of short-term electricity markets and market-based mechanisms. This study presents a systematic review of the evolution of India's electricity market, focusing on the major drivers, barriers, and regulatory instruments influencing the sector. The review examines the development of key market segments, including long-term power purchase agreements, power exchanges, the Day-Ahead Market (DAM), Term-Ahead Market (TAM), Real-Time Market (RTM), and emerging green market mechanisms such as the Green Day-Ahead Market (GDAM). The study also analyzes the role of Renewable Energy Certificates (RECs), Energy Saving Certificates (ESCerts), Market-Based Ancillary Services (MBAS), and the Carbon Credit Trading Scheme (CCTS) in supporting renewable energy integration and enhancing market flexibility. The findings indicate that, despite considerable progress in electricity market development, challenges such as DISCOM financial stress, transmission congestion, dependence on long-term contracts, and regulatory uncertainties continue to affect market efficiency and liquidity. However, ongoing reforms related to ancillary services, energy storage integration, market coupling, and digital grid modernization are expected to improve the transparency, flexibility, and sustainability of India's future electricity market.



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SCHOLARLY PUBLICATIONS
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Journal Name: IEEE Access **IF: 4.2**

Title: Performance Reliability of Ge Nanosheet FETs for Gaussian Distribution Channel Incorporating Interface Trap for RF and Analog Application

Author: Halder A.; Maity S.K.; Dutta M.K.; Banerjee A.; Gupta V.; Dhar R.S.

Details: Volume-14, 18th June, 2026

Abstract: Interface traps at the oxide-semiconductor boundary represent a major reliability concern for Germanium nanosheet Field-Effect Transistors (Ge-NSFETs). In this study, we assessed the device performance of the Ge-NSFET by modeling the trap distribution using a Gaussian profile and systematically varying both the peak trap density and its energy standard deviation (Esig). The results indicate that the subthreshold characteristics are significantly affected by the trap density, leading to a threshold voltage shift, which subsequently degrades the drive current and transconductance (gm). Crucially, the device's intrinsic gain is also profoundly impacted by changes in trap density. Quantitatively, increasing the peak trap density from 1012 cm-2eV-1 to 1013 cm-2eV-1 resulted in a notable 32% degradation in subthreshold swing (SS), a 19% reduction in ON-current, and a 21% decrease in intrinsic gain. Interestingly, the spatial distribution of the trap profile, as measured by the energy standard deviation (Esig), showed little variation in DC and RF parameters relative to the effect of the peak trap density itself.

URL: https://ieeexplore.ieee.org/document/11570091

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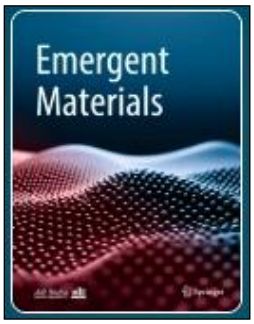
Journal Name: Emergent Materials **IF: 4.0**

Title: Solution-processed kesterite Cu2ZnSnS4 back contact layer to enhance the hole collection and transport in CdTe solar cells

Author: Vikas Vishnu Narayanan V.; Rajni K.S.; Singh U.P.

Details: Volume 9,Issue 6, June 2026

Abstract: In this work, Cu_2ZnSnS_4 (CZTS) thin films were prepared by the spin coating method, varying the spin cycles, used as a back contact layer for CdTe thin film solar cells in superstrate geometry. X-ray diffraction (XRD) and micro-Raman analysis confirmed the formation of pure kesterite-phase CZTS with a grain size ranging from 14.95 to 16.35 nm with p-type electrical conductivity. The FESEM analysis confirmed the uniform coating of thin films over the substrate, which is supported by the AFM analysis. The oxidation states of Cu, Zn, Sn, and S were confirmed from the XPS analysis. The prepared CZTS shows direct allowed transitions with bandgap energy varying from 1.54 to 1.62 eV. The quantitative analysis of electronic states was carried out using the ultraviolet photoelectron spectroscopy (UPS). The combined results indicated that the CZTS thin films can be utilized as a back contact buffer layer for CdTe photovoltaics (CdTe PV). The FTO/CdS/CdTe/CZTS/Ag structured cell produced a PCE of 8.34% with Voc, Jsc, and FF values of 0.684 V, 22.32 mA/$cm^{2,}$ and 54.53%, respectively, which was higher than the reference cell fabricated without the CZTS back contact, indicating the capability of CZTS as a back contact in boosting the performance of CdTe PV.



URL: https://link.springer.com/article/10.1007/s42247-026-01430-7

SCHOLARLY PUBLICATIONS
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Journal Name: IET Renewable Power Generation **IF: 3.2**

Title: Adaptive Control of a PV-Integrated Unified Power Quality Conditioner for Remote Low-Voltage Distribution Networks

Author: Ray, P; Senapati, L; Behera, PK; Mohapatra, A; Kambo, TAT; Samantaray, S; Sahoo, B

Details: Volume 20, Issue 1, June 2026

Abstract: The increasing penetration of distributed energy resources (DERs) in low-voltage distribution networks, driven by renewable energy integration, has introduced significant power quality (PQ) challenges due to extensive power electronic converters interfacing. This paper presents a solar photovoltaic (PV) powered unified PQ conditioner (UPQC) with an advanced adaptive control strategy based on the variable leaky least mean square (VLLMS) algorithm for simultaneous PQ improvement and distributed power management. The proposed controller enables fast extraction and decoupling of non-ideal grid voltage and load current components without the use of low-pass or moving-average filters, resulting in improved convergence speed and real-time controllability. A PV power feed-forward term is incorporated into the shunt converter control to enhance DC-link voltage regulation under fluctuating PV generation. Coordinated operation of the series and shunt converters ensures stable load voltage and unity power factor (UPF) at the point of common coupling (P.C.C) during grid disturbances and nonlinear loading conditions. The adaptive leakage factor based control mechanism prevents parameter drift under dynamic operating conditions. The effectiveness of the proposed PV-UPQC is verified through MATLAB/Simulink simulations and experimental results, demonstrating superior steady-state and transient performance compared with conventional UPQC control schemes, making it suitable for renewable-rich distribution networks.

URL: https://ietresearch.onlinelibrary.wiley.com/doi/10.1049/rpg2.70280

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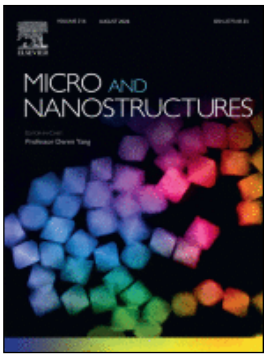
Journal Name: Micro and Nanostructures **IF: 3.1**

Title: Layer-dependent DC, RF, and linearity trade-offs in black phosphorus TFETs

Author: Pahari P.; Mohapatra S.K.; Dastidar A.; Das J.K.; Acharya O.P.; Ray K.

Details: Volume 217, September 2026

Abstract: Black phosphorus (BP) has attracted significant interest for next-generation nano-electronic devices due to its tunable bandgap, high sensitivity to surface charge variations, and strong in-plane anisotropy. Field-effect transistors made of tunnel structures (TFETs) with highly promising channel material have been proposed. The sub-60 mV/dec subthreshold slope operation is highly promising; however, practical deployment in real-world circuits has been hindered by insufficient on-state current and limited RF performance. In this article, a thorough analysis of BP-DG-TFET behaviour as a function of BP thickness from monolayers to five layers has been performed by calibrated TCAD simulations. The analysis has been conducted in terms of DC, transport, RF, and linearity characteristics. It has been found that as BP thickness increases, the bandgap and tunneling barrier width decrease significantly, resulting in marked on-state current, transconductance, gain-bandwidth product, and cut-off frequency improvement from 150 GHz (L4) to ∼210 GHz (L5) and up to ∼260–280 GHz (bulk) of BP layers. Higher order transconductance, harmonic, and compression ratios have pinpointed that there exists an optimal compromise between gain and linearity within TFETs; in this case, the optimal trade-off is attained by the BP layer TFET. This method also shows that the BP thickness engineering method can be successfully applied as a design technique for the optimal trade-off of DC, RF, and linearity performance, and therefore, BP-DG-TFETs are promising for next-generation low-power analog RF application.



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