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Education Information

Doctorate, Universitetet Í Oslo (University Of Oslo), Fizik Bölümü, Norway 1986 - 1990

Postgraduate, Middle East Technical University, Graduate School of Natural and Applied Sciences, Fizik (YI) (Tezli), Turkey 1983 - 1985

Undergraduate, Middle East Technical University, Faculty of Arts and Sciences, Department of Physics, Turkey 1978 - 1983

Dissertations

Doctorate, High Concentration Efects of Ge and As in Si, Universitetet Í Oslo (University Of Oslo), Fizik Bölümü, 1991

Postgraduate, Electron Phonon Interactions in Quantum Well Structures, Middle East Technical University, Graduate School of Natural and Applied Sciences, Fizik (YI) (Tezli), 1985

Academic Titles / Tasks

Professor, Middle East Technical University, Faculty of Arts and Sciences, Department of Physics, 2010 - Continues

Associate Professor, Middle East Technical University, Faculty of Arts and Sciences, Department of Physics, 2006 - 2010

Assistant Professor, Middle East Technical University, Faculty of Arts and Sciences, Department of Physics, 1992 - 1996

Research Assistant, Universitetet Í Oslo (University Of Oslo), Matematik Ve Doğa Bilimleri, Fizik, 1987 - 1991

Research Assistant, Middle East Technical University, Faculty of Arts and Sciences, Department of Physics, 1983 - 1985

Advising Theses

Yerci S., Turan R., Design, fabrication and characterization of interdigitated back contact silicon solar cells, Doctorate, E.HANDE(Student), 2022

TURAN R., Investigation on ionicity and its effect on charge carrier selectivity for N-type crystalline silicon solar cells, Postgraduate, B.MOHAMED(Student), 2022

TURAN R., Production and characterization of amorphous silicon thin-film solar cells on flexible substrates with laser texturing, Doctorate, Z.DEMİRCİOĞLU(Student), 2022

TURAN R., DEVELOPMENT OF SEEDED VERTICAL GRADIENT FREEZE TECHNIQUE FOR CADMIUM ZINC TELLURIDE CRYSTALS, Doctorate, Ö.BAŞAR(Student), 2022

Yerci S., Turan R., Alternative surface texturing, passivation and charge selective contacts for crystalline silicon solar cells, Doctorate, E.SARIGÜL(Student), 2022

Yerci S., Turan R., Improving the performance of monocrystalline silicon PERC solar cells by optimizing front and rear metallization, Postgraduate, H.ASAV(Student), 2022

Yerci S., Turan R., Improvement of silicon heterojunction solar cell performance with new surface structure and wide band gap carrier selective layers, Doctorate, E.DÖNERÇARK(Student), 2021

TURAN R., Expanding the scope of nonparaxial scalar diffraction theory, Doctorate, M.Günöven(Student), 2020

TURAN R., Fabrication of interdigitated back-contact (IBC) solar cells with screen-printed boron doped emitters, Postgraduate, A.Aliiefendioğlu(Student), 2020

TURAN R., Optimization of laser processing for PERC type c-Si solar cells, Postgraduate, E.Genç(Student), 2019

YERCI S., TURAN R., A numerical analysis of interdigitated back contacted silicon solar cells, Postgraduate, B.Acar(Student), 2018

TURAN R., Polysilicon thin film processing on glass and photovoltaic applications, Doctorate, M.Karaman(Student), 2016

TURAN R., YERCI S., Non-contact atomic force microscope (ncfm) operation in uhv using radiation pressure excitation of cantilever, Postgraduate, Y.Uysallı(Student), 2016

TURAN R., YERCI S., Optical and structural characterization of mixed halide perovskite thin films by thermal co-evaporation, Postgraduate, O.Yılmaz(Student), 2016

TURAN R., Novel metal assisted etching technique for enhanced light management in black crystalline SI solar cells /, Doctorate, F.Es(Student), 2015

TURAN R., Fabrication and a complete structural, optical and electrical analysis of porous germanium nanostructures embedded in a dielectric matrix: possibility of third generation solar cell applications, Postgraduate, B.Altuntaş(Student), 2014

ÜNALAN H. E., TURAN R., Fabrication of silicon nanowires by electroless etching and investigation of their photovoltaic applications, Postgraduate, B.Özdemir(Student), 2011

TURAN R., BEK A., Effect of substrate type on structural and optical properties of metal nanoparticles for plasmonic applications, Postgraduate, İ.Tanyeli(Student), 2011

TURAN R., AKATA KURÇ B., Thickness analysis of thin films by energy dispersive x-ray spectroscopy, Postgraduate, S.Canlı(Student), 2010

TURAN R., Si and $si(1-x)ge(x)$ nanocrystals: synthesis, structural characterization, and simultaneous observation of quantum confined and interface related photoluminescence, Doctorate, N.Asghar(Student), 2010

TURAN R., Si nanocrystals in sic matrix and infrared spectroscopy of in a dielectric matrix, Doctorate, A.Gencer(Student), 2010

TURAN R., Structural and electrical properties of flash memory cells with HfO₂ tunnel oxide and with/without nanocrystals, Postgraduate, D.Şahin(Student), 2009

TURAN R., Synthesizing germanium and silicon nanocrystals embedded in silicon dioxide by magnetron sputtering technique, Postgraduate, A.Sinan(Student), 2007

TURAN R., Growth and characterization of thin sio₂ and ta₂o₅ dielectric layers nd : yag laser oxidation, Doctorate, G.Aygün(Student), 2005

TURAN R., Electrical transport in metal oxide semiconductor capacitors, Postgraduate, M.Arikan(Student), 2004

TURAN R., Internal photomission spectroscopy for PtSi/Si and Pt/SiGe schottky type infrared detectors, Postgraduate, B.Aslan(Student), 1999

TURAN R., Synthesis of silicon-germanium by high dose germanium ion implantation into silicon, Postgraduate, M.Şahin(Student), 1999

TURAN R., Electrical properties of silicide/silicon diodes, Postgraduate, N.Akman(Student), 1994

Published journal articles indexed by SCI, SSCI, and AHCI

I. Development of a selective wet-chemical etchant for precise 3D sculpting of silicon enabled by infrared non-linear laser modification

Zolfaghari Borra M., Radfar B., Nasser H., Çolakoğlu T., Tokel O., Turnalı A., DEMİRTAŞ M., Işık Taşgın D., TOFFOLİ

H., Toffoli D., et al.

Optics and Laser Technology, vol.176, 2024 (SCI-Expanded)

- II. **Influence of boron doping profile on emitter and metal contact recombination for n-PERT silicon solar cells**
BEKTAŞ G., Aslan S., Keçeci A. E., Özyahni V., Canar H. H., Asav H., Seyrek S., Verlinden P. J., TURAN R.
Solar Energy Materials and Solar Cells, vol.272, 2024 (SCI-Expanded)
- III. **Annealing-free, electron-selective ohmic contacts using zirconium oxide and aluminum for n-type crystalline silicon solar cells**
Madbouly L. A., Nasser H., Borra M. Z., ÇİFTPINAR E. H., Altiner G., Aliefendioglu A., Canar H. H., TURAN R., ÜNALAN H. E.
Materials Science in Semiconductor Processing, vol.176, 2024 (SCI-Expanded)
- IV. **Development of Low-Cost c-Si-Based CPV Cells for a Solar Co-Generation Absorber in a Parabolic Trough Collector**
Aydin E., Buchroithner A., Felsberger R., Preßmair R., Azgın A., TURAN R., Keçeci A. E., BEKTAŞ G., AKINOĞLU B. G.
Energies, vol.17, no.12, 2024 (SCI-Expanded)
- V. **Surface and interface chemistry of bromine-methanol-etched Cd_{0.9}Zn_{0.1}Te crystals**
ÜNAL M., Karaman M. C., Çelik G., Tüzel O., BALBAŞI Ö. B., Genç A. M., TURAN R.
Surface and Interface Analysis, 2024 (SCI-Expanded)
- VI. **A comparative study on alternative industrial manufacturing routes for bifacial n-PERT silicon solar cells**
BEKTAŞ G., Seyrek S., Keçeci A. E., Aslan S., Özyahni V., Canar H. H., Asav H., Kaplan Y. M., TURAN R.
Progress in Photovoltaics: Research and Applications, vol.31, no.10, pp.1016-1022, 2023 (SCI-Expanded)
- VII. **Production of detector grade CdZnTe crystal with VGF furnace by analyzing segregation of Zn and In**
Ünal M., Balbaşı Ö. B., Sedani S. H., Karaman M. C., Çelik G., Bender D., Genç A. M., Parlak M., Turan R.
Journal of Crystal Growth, vol.615, 2023 (SCI-Expanded)
- VIII. **Thermal and fluid dynamic optimization of a CPV-T receiver for solar co-generation applications: Numerical modelling and experimental validation**
Santos D., Azgın A., Castro J., Kizildag D., Rigola J., TUNÇEL B., TURAN R., Preßmair R., Felsberger R., Buchroithner A.
Renewable Energy, vol.211, pp.87-99, 2023 (SCI-Expanded)
- IX. **High carrier lifetimes in UMG multicrystalline wafers after P- diffusion compatible with high-efficiency cell structures**
Dasilva-Villanueva N., Arikan B., Canar H. H., Fuertes Marron D., Hong B., Kececi A. E., Butuner S. K., Bektas G., Turan R., del Canizo C.
SOLAR ENERGY MATERIALS AND SOLAR CELLS, vol.250, 2023 (SCI-Expanded)
- X. **Ultra-Narrow Linewidth Photo-Emitters in Polymorphic Selenium Nanoflakes**
Hussain N., Ahmed S., Tepe H. U., Huang K., Avishan N., He S., Rafique M., Farooq U., KASIRGA T. S., BEK A., et al.
SMALL, vol.18, 2022 (SCI-Expanded)
- XI. **Optical light management by self-arrangement of inverted tetragonal pyramids on the silicon surface through copper-assisted etching technique in a single step**
Donercark E., Çolakoğlu T., Terlemezoğlu M., Abak M. K., Çiftpinar E. H., Bek A., Turan R.
INTERNATIONAL JOURNAL OF ENERGY RESEARCH, vol.46, no.15, pp.24322-24331, 2022 (SCI-Expanded)
- XII. **Impact of ion implantation and annealing parameters on bifacial PERC and PERT solar cell performance**
Siddiqui A., Bektaş G., Nasser H., Turan R., Usman M.
Sustainable Energy Technologies and Assessments, vol.53, 2022 (SCI-Expanded)
- XIII. **Production of High-Performance CdZnTe Crystals Grown by THM for Radiation Detection Applications**
Ünal M., Balbaşı Ö. B., Karaman M. C., Genç A. M., Parlak M., Turan R.
Journal of Electronic Materials, vol.51, no.9, pp.4675-4680, 2022 (SCI-Expanded)
- XIV. **Fourteen percent efficiency ultrathin silicon solar cells with improved infrared light management enabled by hole-selective transition metal oxide full-area rear passivating contacts**

- Nasser H., Borra M. Z., Çiftpinar E. H., Eldeeb B., Turan R.
PROGRESS IN PHOTOVOLTAICS, vol.30, no.8, pp.823-834, 2022 (SCI-Expanded)
- XV. **Impact of oxygen partial pressure during Indium Tin Oxide sputtering on the performance of silicon heterojunction solar cells**
Donercark E., Guler S., Hande Ciftpinar E., Kabacelik I., Koc M., Cigdem Ercelebi A., TURAN R.
Materials Science and Engineering B: Solid-State Materials for Advanced Technology, vol.281, 2022 (SCI-Expanded)
- XVI. **Interface stability problem towards the end of THM growth of cadmium zinc telluride crystals**
Ünal M., Balbaşı Ö. B., Genç A. M., Parlak M., Turan R.
Journal of Crystal Growth, vol.584, 2022 (SCI-Expanded)
- XVII. **Investigation of seeded vertical gradient freeze (VGF) growth of CdZnTe bulk crystals**
Balbaşı Ö. B., Ünal M., Genç A. M., Çelik G., Parlak M., Turan R.
Journal of Crystal Growth, vol.584, 2022 (SCI-Expanded)
- XVIII. **Advanced approach for oxygen transport and crystallization front calculation in Cz silicon crystal growth**
Borisov D., Artemyev V., Kalaev V., Smirnov A., Kuliev A., Zobel F., Kunert R., TURAN R., Aydin O., Kabacelik I.
Journal of Crystal Growth, vol.583, 2022 (SCI-Expanded)
- XIX. **Physical device simulation of dopant-free asymmetric silicon heterojunction solar cell featuring tungsten oxide as a hole-selective layer with ultrathin silicon oxide passivation layer**
Mehmood H., Nasser H., Zaidi S. M. H., Tauqeer T., TURAN R.
RENEWABLE ENERGY, vol.183, pp.188-201, 2022 (SCI-Expanded)
- XX. **Interface and material properties of wide band gap a-SiCx:H thin films for solar cell applications**
Donercark E., Sedani S. H., Kabaçelik I., Salimi A., TURAN R.
Renewable Energy, vol.183, pp.781-790, 2022 (SCI-Expanded)
- XXI. **Integration of graphene with GZO as TCO layer and its impact on solar cell performance**
Zan R., Olgar M. A., Altuntepe A., Seyhan A., TURAN R.
RENEWABLE ENERGY, vol.181, pp.1317-1324, 2022 (SCI-Expanded)
- XXII. **Simplified process flow for the fabrication of PERC solar cells with ion implanted emitter**
Bektas G., Kokbudak G., Kececi A. E., Butuner S. K., Asav H., Ciftpinar E. H., Canar H. H., Arikan B., Turan R.
Renewable Energy, vol.179, pp.2295-2299, 2021 (SCI-Expanded)
- XXIII. **Spreading Resistance Modeling for Contact Resistivity Extraction in Ohmic Multilayer Structures With Circular Electrodes**
Turkay D., Tsoi K., Donercark E., TURAN R., YERCI S.
IEEE TRANSACTIONS ON ELECTRON DEVICES, vol.68, no.12, pp.6344-6351, 2021 (SCI-Expanded)
- XXIV. **Hybrid transparent conductive electrode structure for solar cell application**
Altuntepe A., Olgar M. A., Erkan S., Hasret O., Kececi A. E., Kokbudak G., TOMAKIN M., Seyhan A., TURAN R., Zan R.
RENEWABLE ENERGY, vol.180, pp.178-185, 2021 (SCI-Expanded)
- XXV. **Spreading resistance modeling for rapid extraction of contact resistivity with a four-point probe**
Turkay D., Tsoi K., Donercark E., Turan R., Yerci S.
Solar Energy Materials and Solar Cells, vol.230, 2021 (SCI-Expanded)
- XXVI. **Effect of amorphous SiC layer on electrical and optical properties of Al/a-SiC/c-Si Schottky diode for optoelectronic applications**
Barbouche M., Benabderrahmane Zaghouni R., Ben Ammar N., Aglieri V., Nasser H., TURAN R., Ezzaouia H.
Journal of Materials Science: Materials in Electronics, vol.32, no.15, pp.20598-20611, 2021 (SCI-Expanded)
- XXVII. **Laser Crystallization of Amorphous Ge Thin Films via a Nanosecond Pulsed Infrared Laser**
Korkut C., Cinar K., Kabacelik I., TURAN R., Kulakci M., BEK A.
CRYSTAL GROWTH & DESIGN, vol.21, no.8, pp.4632-4639, 2021 (SCI-Expanded)
- XXVIII. **On the application of hole-selective MoOx as full-area rear contact for industrial scale p-type c-Si solar cells**
Nasser H., ES F., Zolfaghari Borra M., SEMİZ E., Kokbudak G., Orhan E., TURAN R.
PROGRESS IN PHOTOVOLTAICS, vol.29, no.3, pp.281-293, 2021 (SCI-Expanded)

- XXIX. **Nanosphere Concentrated Photovoltaics with Shape Control**
Esmaeilzad N. S., Demir A. K., Hajivandi J., Ciftpinar H., Turan R., Kurt H., Bek A.
ADVANCED OPTICAL MATERIALS, vol.9, no.3, 2021 (SCI-Expanded)
- XXX. **On the electrical and charge conduction properties of thermally evaporated MoOx on n- and p-type crystalline silicon**
GÜLNAHAR M., Nasser H., Salimi A., Turan R.
JOURNAL OF MATERIALS SCIENCE-MATERIALS IN ELECTRONICS, vol.32, no.1, pp.1092-1104, 2021 (SCI-Expanded)
- XXXI. **Ultra-thin Al₂O₃ capped with SiN_x enabling implied open-circuit voltage reaching 720mV on industrial p-type Cz c-Si wafers for passivated emitter and rear solar cells**
Koekbudak G., Kececi A. E., Nasser H., TURAN R.
JOURNAL OF VACUUM SCIENCE & TECHNOLOGY A, vol.39, no.1, 2021 (SCI-Expanded)
- XXXII. **Implementation of generalized Harvey-Shack theory in light scattering from rough surfaces**
Gunoven M., Nasser H., Ünal M., Aytakin O., Turan R., Bek A.
PHYSICAL REVIEW A, vol.102, no.6, 2020 (SCI-Expanded)
- XXXIII. **Numerical analysis of dopant-free asymmetric silicon heterostructure solar cell with SiO₂ as passivation layer**
Mehmood H., Nasser H., Tauqeer T., TURAN R.
INTERNATIONAL JOURNAL OF ENERGY RESEARCH, vol.44, no.13, pp.10739-10753, 2020 (SCI-Expanded)
- XXXIV. **Angular Dependence of Solar Cell Parameters in Crystalline Silicon Solar Cells Textured with Periodic Array of Microholes**
Altinoluk S., Kumar N., ÇİFTPINAR E. H., Demircioglu O., TURAN R., Vasileska D.
GLOBAL CHALLENGES, vol.4, no.9, 2020 (SCI-Expanded)
- XXXV. **Introduction; PVCon 2018**
Akinoglu B. G., TURAN R., Kalogirou S.
RENEWABLE ENERGY, vol.154, pp.1006-1007, 2020 (SCI-Expanded)
- XXXVI. **MoOx/Ag/MoOx multilayers as hole transport transparent conductive electrodes for n-type crystalline silicon solar cells**
Akdemir O., Borra M. Z., Nasser H., TURAN R., BEK A.
INTERNATIONAL JOURNAL OF ENERGY RESEARCH, vol.44, no.4, pp.3098-3109, 2020 (SCI-Expanded)
- XXXVII. **Optimization of PERC fabrication based on loss analysis in an industrially relevant environment: First results from GUNAM photovoltaic line (GPVL)**
ES F., SEMİZ E., Orhan E., Genc E., Kokbudak G., Baytemir G., TURAN R.
RENEWABLE ENERGY, vol.146, pp.1676-1681, 2020 (SCI-Expanded)
- XXXVIII. **Effects of boron doping on solid phase crystallization of in situ doped amorphous Silicon thin films prepared by electron beam evaporation**
Sedani S. H., Yasar O. F., Karaman M., TURAN R.
THIN SOLID FILMS, vol.694, 2020 (SCI-Expanded)
- XXXIX. **Impact of rapid thermal annealing on impurities removal efficiency from silicon carbide for optoelectronic applications**
Barbouche M., Zaghouni R. B., Benammar N. E., Khirouni K., Turan R., Ezzaouia H.
INTERNATIONAL JOURNAL OF ADVANCED MANUFACTURING TECHNOLOGY, vol.106, pp.731-739, 2020 (SCI-Expanded)
- XL. **Co-sputtered Cu₂ZnTi(S:Se)₄ absorbers for thin film solar cells**
Batibay D., OCAK Y. S., GENİŞEL M. F., TURAN R.
RENEWABLE ENERGY, vol.145, pp.1672-1676, 2020 (SCI-Expanded)
- XLI. **Effects of different laser modified surface morphologies and post-texturing cleanings on c-Si solar cell performance**
Radfar B., ES F., TURAN R.
RENEWABLE ENERGY, vol.145, pp.2707-2714, 2020 (SCI-Expanded)
- XLII. **One-year performance evaluation of two newly developed back-contact solar modules in two**

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ÖZDEN T., Carr A. J., Geerligs B. (. J.), TURAN R., AKINOĞLU B. G.
RENEWABLE ENERGY, vol.145, pp.557-568, 2020 (SCI-Expanded)

- XLIII. **Enhanced metal assisted etching method for high aspect ratio microstructures: Applications in silicon micropillar array solar cells**
Baytemir G., ÇİFTPINAR E. H., TURAN R.
SOLAR ENERGY, vol.194, pp.148-155, 2019 (SCI-Expanded)
- XLIV. **Simulation of silicon heterostructure solar cell featuring dopant-free carrier-selective molybdenum oxide and titanium oxide contacts**
Mehmood H., Nasser H., Tauqeer T., TURAN R.
RENEWABLE ENERGY, vol.143, pp.359-367, 2019 (SCI-Expanded)
- XLV. **Comparison of influence of gold contamination on the performances of planar and three dimensional c-Si solar cells**
Baytemir G., Es F., TURAN R.
RENEWABLE ENERGY, vol.142, pp.393-399, 2019 (SCI-Expanded)
- XLVI. **Solid phase epitaxial thickening of boron and phosphorus doped polycrystalline silicon thin films formed by aluminium induced crystallization technique on glass substrate**
Ozmen O. T., Karaman M., Sedani S. H., Sagban H. M., TURAN R.
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- XLVII. **Electrical, optical and surface characterization of reactive RF magnetron sputtered molybdenum oxide films for solar cell applications**
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MATERIALS SCIENCE IN SEMICONDUCTOR PROCESSING, vol.101, pp.46-56, 2019 (SCI-Expanded)
- XLVIII. **Alternative HF-free etching solution for aluminum induced texturing of glass surface with improved haze**
ÜNAL M., TANKUT A., TURAN R.
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- XLIX. **Water Impact Resistant and Antireflective Superhydrophobic Surfaces Fabricated by Spray Coating of Nanoparticles: Interface Engineering via End-Grafted Polymers**
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Articles Published in Other Journals

- I. **Role of ionic crystals as interfacial layers in metal-semiconductor junction**
Eldeeb B., Nasser H., TURAN R.
Applied Research, 2024 (Scopus)
- II. **Farklı Üretim Parametrelerinin Katı Faz Kristalizasyon (SPC) Tekniği Kullanılarak Üretilen Polikristal Silisyum İnce Filmlerin Kalitesi Üzerine Etkileri**
TÜZÜN ÖZMEN Ö., Sedani S. H., karaman m., GÖKŞEN K., TURAN R.
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- III. **Fabrication and characterization of Si-PIN photodiodes**
Doganci E., Kaya S., Aktag A., Duman E. S., TURAN R., Karacali H., Yilmaz E.
TURKISH JOURNAL OF PHYSICS, vol.43, no.6, pp.556-562, 2019 (ESCI)

Books & Book Chapters

- I. **Characterization of Si Nanocrystals**
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Refereed Congress / Symposium Publications in Proceedings

- I. **Optimization of front and rear surface dielectric passivation layers for ion implanted PERC solar cells**
BEKTAŞ G., Canar H. H., Keçeci A. E., Asav H., Seyrek S., Bütüner S. K., TURAN R.
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- II. **Silicon heterojunction solar cell efficiency improvement with wide optical band gap amorphous silicon carbide emitter**
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12th International Conference on Crystalline Silicon Photovoltaics, SiliconPV 2022, Hybrid, Konstanz, Germany, 28 - 30 March 2022, vol.2826
- III. **The effect of SiNx:H stoichiometry on electrical and chemical passivation of Al₂O₃/SiNx:H stack layer on p-type silicon wafers**
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12th International Conference on Crystalline Silicon Photovoltaics, SiliconPV 2022, Hybrid, Konstanz, Germany, 28 - 30 March 2022, vol.2826
- IV. **Effect of Implanted Phosphorus Profile on iVoc Variations During Firing Process of n-type Silicon**
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- V. **Effect of surface morphology on passivation quality of Al₂O₃/SiNx stack layer for PERC solar cell**
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- VI. **Effect of Doping Profile on Contact Resistivity Between Screen Printed Ag/Al and Implanted Boron Emitter**
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- VII. **Selective Emitter Formation via Laser Doping with Picosecond Pulsed Laser for High-Efficiency PERC Solar Cells**
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- VIII. **Performance Enhancement of PERC Solar Cell with SiO_xN_y Back Surface Passivation by Low Temperature Annealing Process**
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- IX. **Comparison of Electrical Performances of Fully Ion Implanted n-PERT Solar Cells Made of Different n-Type Wafer Feedstocks**
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- X. **Laser Induced Periodic Surface Structured c-Si Solar Cell with more than 16% efficiency**
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- XI. **Laser induced periodic surface structured c-Si solar cell with more than 16% efficiency**
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- XII. **A Study on Tetragonal-star Like Shaped Inverted Pyramid Texturing**
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- XIII. **Single Step Inverted Pyramid Texturing of n-type Silicon by Copper Assisted Chemical Etching**
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- XIV. **Laser induced periodic surface structured c-Si solar cell with more than 16% efficiency**
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2021 European Conference on Lasers and Electro-Optics, CLEO/Europe 2021, Virtual, Online, Germany, 21 - 25 June 2021
- XV. **Concentrated Photovoltaics Using Shape-modified Nanospheres**
Esmailzad N. S., Ciftpinar H., TURAN R., BEK A.
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