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Near Infrared Laser Annealing of CdTe and *In-Situ* Measurement of the Evolution of Structural and Optical Properties

J. Applied Physics **119**, 165305 (2016). DOI: <http://dx.doi.org/10.1063/1.4947186>

31 Jeffery A. Aguiar, Mehmet E. Erkan, Dennis Pruzan, Akira Nagaoka, Kenji Yoshino, Helio Moutinho, Mowafak Al-Jassim, and Michael A. Scarpulla

Cation ratio fluctuations in Cu2ZnSnS4 at the 20 nm length scale investigated by analytical electron microscopy

Physica Status Solidi A 213: 2392–2399 (2016) DOI: <http://dx.doi.org/10.1002/pssa.201600060> .

30 K. Alberi and M.A. Scarpulla

Suppression of native defect formation during semiconductor processing via excess carrier generation

Scientific Reports **6**, 27954 (2016). DOI: <http://dx.doi.org/10.1038/srep27954>

29 Daniel L. Jacobs, Michael A. Scarpulla, Chen Wang, Benjamin R. Bunes, Ling Zang

Voltage Induced Transients in Methyl Ammonium Lead Triiodide Probed by Dynamic Photoluminescence Spectroscopy

J. Physical Chemistry C **120** (15), pp 7893–7902 (2016). <http://dx.doi.org/10.1021/acs.jpcc.5b11973>

28 Mehmet Eray Erkan, Vardaan Chawla, and Michael A. Scarpulla

Reduced defect density at CZTSSe/CdS interface by atomic layer deposition of Al2O3

J. Applied Physics **119**, 194504 (2016). DOI: <http://dx.doi.org/10.1063/1.4948947>

**2015**

27 Matthew M. Nowell, Mike A. Scarpulla, Naba R. Paudel, Kristppher A. Wieland,

Alvin D. Compaan, and Xiangxin Liu

Characterization of Sputtered CdTe Thin Films with Electron Backscatter Diffraction and Correlation with Device Performance

Microscopy and Microanalysis **21**(4), 927-935 (2015). <http://dx.doi.org/10.1017/S143192761500077X>

26 Brian J. Simonds, Vipul Kheraj, Vasilios Palekis, Christos Ferekides, Michael A. Scarpulla

Reduction of Fermi level pinning and recombination at polycrystalline CdTe surfaces by laser irradiation

J. Applied Physics, **117**, 225301 (2015). <http://dx.doi.org/10.1063/1.4921950>

25 Akira Nagaoka, Ryoji Katsube, Shigeru Nakatsuka, Kenji Yoshino, Tomoyasu Taniyama, Hideto Miyake, Koichi Kakimoto, Michael A. Scarpulla, and Yoshitaro Nose

Growth and Characterization of Cu2ZnSn(SxSe1-x)4 Single Crystal Grown by Traveling Heater Method

J. Crystal Growth, **423** pp. 9-15 (2015). <http://dx.doi.org/10.1016/j.jcrysgro.2015.04.012>

24 Akira Nagaoka, Yoshitaro Nose, Hideto Miyake, Michael A. Scarpulla, Kenji Yoshino

Solution growth of chalcopyrite compounds single crystal

Renewable Energy **79**, pp. 127–130 (2015). <http://dx.doi.org/10.1016/j.renene.2014.10.015>

23 Mehmet Eray Erkan, Vardaan Chawla, Ingrid Repins, and Michael A. Scarpulla

Interplay between surface preparation and device performance in CZTSSe solar cells: Effects of KCN and NH4OH etching

Solar Energy Materials and Solar Cells, **136** pp. 78-85 (2015). <http://dx.doi.org/10.1016/j.solmat.2015.01.006>

22 Brian J. Simonds, Helene J. Meadows, Sudhajit Misra, Christos Ferekides, Phillip J. Dale, Michael A. Scarpulla

Laser Processing for Thin Film Chalcogenide Photovoltaics: A Review and Prospectus

Journal of Photonics for Energy **5**(1) 050999 (2015). <http://dx.doi.org/10.1117/1.JPE.5.050999>

*JPE Homepage Featured Article Jan 2015*

21 Helen J. Meadows, David Regesch, Maxime Thevenin, Jan Sendler, Thomas Schuler, Sudhajit Misra, Brian J. Simonds, Michael A. Scarpulla, Viktor Gerliz, Levent Gütay, Jerome Guillot, Phillip J Dale

CuInSe2 semiconductor formation by laser annealing

Thin Solid Films **582**, pp. 23–26 (2015). <http://dx.doi.org/10.1016/j.tsf.2014.10.042>

**2014**

20 Brian J. Simonds, Vasilios Palekis, Brian Van Devener, Christos Ferekides and Michael A. Scarpulla

Surface stoichiometry of pulsed ultraviolet laser treated polycrystalline CdTe

Journal of Applied Physics **116**, 013506 (2014); <http://dx.doi.org/10.1063/1.4887079>

19 Hui Du, Fei Yan, Matthew Young, Bobby To, Chun-Sheng Jiang, Pat Dippo, Darius Kuciauskas, Zhenhuan Chi, Elizabeth A. Lund, Chris Hancock, Win Maw Hlaing OO, Mike A. Scarpulla and Glenn Teeter, [Investigation of combinatorial coevaporated thin film Cu2ZnSnS4. I. Temperature effect, crystalline phases, morphology, and photoluminescence](http://scitation.aip.org/content/aip/journal/jap/115/17/10.1063/1.4871664)

Journal of Applied Physics **115**, 173502 (2014); <http://dx.doi.org/10.1063/1.4871664>

18 Elizabeth A. Lund, Hui Du, Win Maw Hlaing OO, Glenn Teeter, and Michael A. Scarpulla

[Investigation of combinatorial coevaporated thin film Cu2ZnSnS4 (II): Beneficial cation arrangement in Cu-rich growth](http://scitation.aip.org/content/aip/journal/jap/115/17/10.1063/1.4871665)

Journal of Applied Physics **115**, 173503 (2014); <http://dx.doi.org/10.1063/1.4871665>

17 Akira Nagaoka, Hideto Miyake, Tomoyasu Taniyama, Koichi Kakimoto, Yoshitaro Nose, Michael A. Scarpulla, and Kenji Yoshino

Effects of sodium on electrical properties in Cu2ZnSnS4 single crystal >100 citations as of 2020

Applied Physics Letters **104**, 152101 (2014); <http://dx.doi.org/10.1063/1.4871208>

16 Brian J. Simonds, Vasilios Palekis, Brian Van Devener, Christos Ferekides, Michael A. Scarpulla

Pulsed Laser Induced Ohmic Back Contact in CdTe Solar Cells

Applied Physics Letters **104**, 141604 (2014); <http://dx.doi.org/10.1063/1.4870838>

15 [Junyi Zhu](http://scitation.aip.org/search;jsessionid=3nl6ta6s75hc.x-aip-live-02?value1=Junyi+Zhu&option1=author&noRedirect=true), [Feng Liu](http://scitation.aip.org/search;jsessionid=3nl6ta6s75hc.x-aip-live-02?value1=Feng+Liu&option1=author&noRedirect=true), and Michael A. Scarpulla

Strain tuning of native defect populations: The case of Cu2ZnSn(S,Se)4

APL Materials **2** 012110 (2014). <http://dx.doi.org/10.1063/1.4863076>

14 H.J. Meadows, A. Bhatia, V. Depredurand, J. Guillot, D. Regesch, A. Malyeyev, D. Colombara, M.A. Scarpulla, S. Siebentritt, and P.J. Dale

Single Second Laser Annealed CuInSe2 Semiconductors from Electrodeposited Precursors as Absorber Layers for Solar Cells

Journal of Physical Chemistry C **118** 1451−1460 (2014). <http://dx.doi.org/10.1021/jp409804s>

**2013**

13 V. Kosyak, N.B. Mortazavi Amiri, A.V. Postnikov, and M.A. Scarpulla

A Quasichemical Model of Native Point Defect Equilibrium in Cu2ZnSnS4 (CZTS) and Application to One-Zone Annealing

Journal of Applied Physics, **114** 124501 (2013). <http://dx.doi.org/10.1063/1.4819206>

12 A. Bhatia, H. Meadows, A. Crossay, P. J. Dale and M. A. Scarpulla

Continuous wave solid phase laser annealing of electrochemically deposited CuInSe2 thin films

Journal of Applied Physics, **114** 044904 (2013). [http://dx.doi.org/10.1063/1.4816250](http://link.aip.org/link/doi/10.1063/1.4816250)

11 J.R. Nagel and M.A. Scarpulla

Enhanced Light Absorption in Thin Film Solar Cells with Embedded Dielectric Nanoparticles: Induced Texture Dominates Mie Scattering

Applied Physics Letters, **102** 151111 (2013). [http://dx.doi.org/10.1063/1.4802718](http://link.aip.org/link/doi/10.1063/1.4802718)

10 S. Lee, M.A. Scarpulla, E. Bamberg

Effect of metal coating on machinability of high purity germanium using wire electrical discharge machining

J. Materials Processing Technology, **213**(6) 811-817 (2013). <http://dx.doi.org/10.1016/j.jmatprotec.2012.12.008>

9 A. Bhatia, H. Meadows, W.M. Hlaing Oo, P.J. Dale and M.A. Scarpulla

Effects of pulsed laser annealing (PLA) on deep level defect populations in electrochemically-deposited and annealed CuInSe2 thin films

Thin Solid Films, **531** 566-571 (2013). <http://dx.doi.org/10.1016/j.tsf.2012.12.076>

8 J.R. Nagel and M.A. Scarpulla

Design principles for light-trapping in thin silicon films with embedded dielectric nanoparticles

Progress in Photovoltaics: Research and Applications, **21**(3) 319-325 (2013). <http://dx.doi.org/10.1002/pip.1187>.

**2012**

7 V. Kosyak, M. A. Karmarkar, and M.A. Scarpulla

Temperature-dependent conductivity of polycrystalline Cu2ZnSnS4 thin films

Applied Physics Letters, **100** 263903 (2012). <http://dx.doi.org/10.1063/1.4731875>

6 A. Bhatia, W.M. Hlaing Oo, G. Siegel, P.R. Stone, K.M. Yu and M.A. Scarpulla

Synthesis of Ge1-xSn*x* Alloy Thin Films Using Ion Implantation and Pulsed Laser Melting (II-PLM)

 J. Electronic Materials, **41**(5) 837-844 (2012). <http://dx.doi.org/10.1007/s11664-012-2011-z>

5 E.A. Lund and M.A. Scarpulla

Photovoltaic heterojunctions of earth abundant semiconductors: band alignments in the defective limit

Materials Science and Engineering B, **177** 1436– 1440 (2012). <http://dx.doi.org/10.1016/j.mseb.2012.02.015>

**2011**

4 Win Maw Hlaing Oo, Jeff L. Johnson, Ashish Bhatia, Elizabeth A. Lund, Matt M. Nowell, and Michael A. Scarpulla

Grain Size and Texture of Cu2ZnSnS4 Thin Films Synthesized by Co-sputtering Binary Sulfides and Annealing: Effects of Processing Conditions and Sodium

J. Electronic Materials **40**(11) 2214-2221 (2011). >100 citations as of 2020

[http://link.springer.com/article/10.1007%2Fs11664-011-1729-3](http://link.springer.com/article/10.1007/s11664-011-1729-3)

3 Katy Hartman, Jeff L. Johnson, Mariana I. Bertoni, Daniel Recht, Michael J. Aziz, Michael A. Scarpulla, and Tonio Buonassisi

SnS thin-films by RF sputtering at room temperature

Thin Solid Films **519**(21) 7421-7424 (2011). <http://dx.doi.org/10.1016/j.tsf.2010.12.186>

>200 citations as of 2020

2 J.R. Nagel, S. Blair, and M.A. Scarpulla

Exact field solution to guided wave propagation in lossy thin films

Optics Express **19**(21) 20159–20171 (2011). <http://dx.doi.org/10.1364/OE.19.020159>

**2010**

1 J.R. Nagel and M.A. Scarpulla

Enhanced absorption in optically thin solar cells by scattering from embedded dielectric nanoparticles

Optics Express **18**(102) A139 (2010). <http://dx.doi.org/10.1364/OE.18.00A139>

>100 citations as of 2020

**Other Publications**

Michael Scarpulla and Sudhajit Misra, *Laser annealing in thin-film chalcogenide photovoltaics.*

SPIE Newsroom (invited) (2016). DOI: 10.1117/2.1201609.006368

**Thesis Opponent**

External examiner (opponent) for Antti Karjalainen's PhD thesis "Defect identification in complex oxides: positron annihilation spectroscopy of β-Ga2O3 and SrTiO3", Department of Applied Physics, Aalto University, Sweden. 5/28/2021 (via Zoom)

**Tutorials at Major Conferences**

## M.A. Scarpulla, Introduction to Thin Film Chalcogenide Photovoltaics and Their Analysis and Simulation

Area 2 Tutorial, IEEE PVSC (virtual, June 2021)

## M.A. Scarpulla, Introduction to Thin Film Chalcogenide Photovoltaics and Their Analysis and Simulation

Area 2 Tutorial, IEEE PVSC (virtual, June 2020)

## M. A. Scarpulla, *Electrical Device Characterization and Modeling of Thin-Film Solar Cells*

## Part of Tutorial ES20—Young Scientist Tutorial on Characterization Techniques for Thin-Film Solar Cells, MRS Spring (April 22, 2019)

## M. A. Scarpulla, *Electrical Device Characterization of Thin-Film Solar Cells*

Area 2 Tutorial, IEEE PVSC (June 16, 2019)

**Patents & Disclosures**

***Granted Patents (2)***

Carina Hann, Dennis Pruzan, and Michael A. Scarpulla

**Methods for Creating Cadmium Telluride (CdTe) and Related Alloy Film**

US 10,453,988 2019

**Ultra-compact inductor made of 3D Dirac semimetal**

Berardi Sensale Rodriguez, Ashish Chanana, Steven M Blair, Vikram Deshpande, Michael A Scarpulla, Hugo Orlando Condori, Jeffrey Walling

US Patent 11,563,078 2023

***Disclosures to U of Utah TVC (7)***

Brian J. Simonds, Sudhajit Misra, Michael A. Scarpulla

In-situ monitoring technique for CdTe processing 5/16/2014

Brian J. Simonds, Michael A. Scarpulla, Chris Ferekides, Vasilios Palekis, and Naba Paudel

Chlorine treatment of CdTe via application of electromagnetic energy 7/28/14

Brian Simonds, Mike Scarpulla, Chris Ferekides, Vasilios Palekis

Pulsed Laser Enhanced CdTe Photovoltaic Cell (2013)

Michael A. Scarpulla, Phillip J. Dale, Helen J. Meadows, Thomas Schuler, Vicente R. Adonis

Mini Annealing Oven, U-5673. 10/16/2013

M. Hymas, E.A. Lund, and M.A. Scarpulla

Chemical Bath Deposition (CBD) Process for Cadmium Telluride Thin Films

(2013)

A. Bhatia, H. Meadows, P.J. Dale, and M.A. Scarpulla

Solid Phase Continuous Wave Laser Annealing of Electrodeposited Chalcopyrite Thin Films for Photovoltaic Application

(Provisional US Patent Filed, 2012)

E. Bamberg, M.A. Scarpulla, D. Rakwal

Wire electrical discharge machining (WEDM) of high-resistivity semiconductors through local and temporal enhancement of electrical conductivity (2009)

***Invited Oral Presentations***

M.A. Scarpulla

Where are the defects in Ga2O3 and how did they get there?

Paul Drude Institute, Berlin GraFOx Seminar April 21, 2022

M.A. Scarpulla

Shining the Spotlight on Defects in Ga2O3

School of Microelectronics, special seminar, Xidian University, China. Once yearly seminar. Attendance on Zoom >290 graduate students and other researchers. Virtual, Nov. 22 2021

M.A. Scarpulla

Manipulation of Defects in Ga2O3

WOCSEMMAD 2022, Miramar Beach Florida, 23 Feb 2022

M.A. Scarpulla

Where are the defects in Ga2O3 and how did they get there?

ACS Electronic Materials and Applications 2022 (EMA 2022), Jan 19-21 2022, Orlando FL

M.A. Scarpulla

Shining the Spotlight on Defects in Ga2O3

Penn State U Engineering Science and Mechanics Graduate Seminar, Oct. 27, 2021

M.A. Scarpulla

Shining the Spotlight on Defects in Ga2O3

Invited Plenary, International Conference on Defects in Semiconductors ICDS 2021 (Oslo, Sweeden, virtual July 2021). Conference occurs odd years.

M.A. Scarpulla

How grain boundary structure and composition are affected by CdTe solar cell processing and affect performance

European MRS (EMRS) virtual June 3, 2021

M.A. Scarpulla, et al.

Photoluminescence and disorder in CdTe thin films

CSU / First Solar CdTe Workshop, virtual, Oct (2020)

M.A. Scarpulla, K. Ahn, Y. K. Ooi, D. Feezell, F. Mirkhosravi, E. Mace, J. Gallagher, A. Lintereur

Gamma Ray Irradiation Effects in Ga-Polar and N-Polar GaN

WOCSEMMAD 2020, Palm Springs CA, Feb (2020)

M.A. Scarpulla, et al.

As doping & lifetime in single crystal CdTe and effects of Grain Boundaries at Back Contacts

CSU / First Solar CdTe Workshop, Golden, CO (2019)

M.A. Scarpulla, et al.

As doping, grain boundaries, and photo effects on defects in CdTe

CSU / First Solar CdTe Workshop, San Jose, CA Nov. 2-3 (2017)

M.A. Scarpulla, et al.

Processing and Characterization of CdTe Back Contacts

CSU-IEECAS CdTe Workshop, Beijing China Nov 12-13 2016

M.A. Scarpulla, et al.

Effects of Excess Carriers on Point Defect Formation

CO School of Mines, Physics Department Colloquium, Oct 11 2016

M.A. Scarpulla, et al.

Processing and Characterization of CdTe for thin film photovoltaics

BYU Physics Department Seminar, Sept 28 2016

M.A. Scarpulla, et al.

Processing and Characterization of CdTe for thin film photovoltaics

UT Austin / CSU [I/UCRC for Next Generation Photovoltaics](http://www.nextgenpv.org/) Seminar, Sept 6 2016

M.A. Scarpulla, et al.

Laser processing of compound semiconductor thin film photovoltaics

SPIE Photonics West, San Fransisco CA (Feb. 18, 2016)

M.A. Scarpulla, et al.

Laser Processing of CdTe for Thin Film Photovoltaics

Physics Dept., Washington State U, Pullman, WA (Nov. 17, 2015)

D. Pruzan, et al.

SLAC Users Meeting, Stanford, CA (Oct. 2015)

M.A. Scarpulla, et al.,

Can CZTS Live up to its Promise?: Perspectives from Defect Spectroscopies

Physics Dept., U Oregon, Eugene, OR (Apr 2015)

M.A. Scarpulla, et al.

Can CZTS Live up to its Promise?: Perspectives from Defect Spectroscopies

Physics Dept., Oklahoma State University, Oklahoma City, OK (Apr 2015)

M.A. Scarpulla, et al.

Can CZTS Live up to its Promise?: Perspectives from Defect Spectroscopies

Physics Dept., Colorado State University, Ft. Collins, CO (Feb 2015)

M.A. Scarpulla, et al.

Laser Processing of CdTe for Thin Film Photovoltaics

First Solar, Inc. Santa Clara, CA (Oct 2014)

M.A. Scarpulla, et al.

Laser Processing of CdTe for Thin Film Photovoltaics

Sunpower, Inc. Santa Clara, CA (Oct 2014)

M.A. Scarpulla, et al.

Laser Processing of CdTe for Thin Film Photovoltaics

BAPVC Semiannual Meeting, Stanford (Oct 2014)

M.A. Scarpulla, et al.

Laser Processing of CdTe for Thin Film Photovoltaics

First Solar, Inc. Webinar (June 2014)

M.A. Scarpulla, et al.

Laser Annealing and Defect Studies in Thin Films for Photovoltaics

UC Berkeley MSE Department Seminar (Nov. 2013)

M.A. Scarpulla, et al.

Laser Processing of CdTe for Thin Film Photovoltaics

BAPVC Semiannual Meeting, Stanford (May 2013)

M.A. Scarpulla, et al.,

Defect Studies of CZTSSe Thin Film Photovoltaic Materials

Université de Lorraine, Metz, France (May 2013)

P.J. Dale, et al.,

Three ways to grow faster and better CIGSe: In-Ga co-electrodeposition, 1 second laser annealing, and Cu-rich growth

HZB 5th Photovoltaics Thin-Film Week, Berlin, Germany, (April 2013)

M.A. Scarpulla, et al.,

Defect Studies on Earth Abundant CZTSSe Photovoltaic Absorber Layers

Accelerating the Development of Earth-Abundant Thin-Film Photovoltaics Workshop, CalTech

(Mar. 2013)

M.A. Scarpulla, et al.,

Defect Studies on Earth Abundant CZTSSe Photovoltaic Absorber Layers

Sunshot / NREL / IBM Workshop on CZTSSe (Jan. 2013)

M.A. Scarpulla, et al.,

Growth, Composition, Phase, Grain Boundary, and Defect Studies of CZTSSe

MSE Department, Iowa State University (Nov. 2012)

M.A. Scarpulla, et al.,

Growth, Composition, Phase, Grain Boundary, and Defect Studies of CZTSSe

MSE Department, University of Illinois Urbana-Champain (Nov. 2012)

M.A. Scarpulla, et al.,

Growth, Composition, Phase, Grain Boundary, and Defect Studies of CZTSSe

Minnesota Nano Workshop, University of Minnesota (Nov. 2012)

L. Grenet et al.,

Electrical detection of defects in Cu2ZnSn(S1-xSex)4 based solar cells

Third European Kesterite Workshop, University of Luxembourg (Nov. 2012)

M.A. Scarpulla

Defects, CIGSSe, and CZTSSe

NREL/DOE HOPE Tutorial, NREL (July 2012)

M.A. Scarpulla and J.R. Nagel

Photonic Concepts for Improving Light Absorption in Thin Si Solar Cells

ECE Department, University of Texas Austin (June 2012)

M.A. Scarpulla and E.A. Lund

Earth-Abundant Photovoltaic Heterojunctions in the Defective Limit

XX International Materials Research Congress, Cancun, Mexico (Aug. 2011)

M.A. Scarpulla et al.

Pulsed-laser annealing of electrodeposited CuInSe2 thin-film photovoltaic absorber layers

NSF Workshop on Laser Processing and Energy Applications, Berkeley, CA (Jan. 2011)

M.A. Scarpulla et al.

Light Trapping in Thin Film Si Solar Cells

Seminar, Laboratoire Photovoltaïque, Université du Luxembourg (Nov. 2010)

M.A. Scarpulla et al.

Commodity Element Chalcogenide Semiconductors for >GW-Scale Photovoltaics

Electrochemical Society Meeting, Las Vegas, NV (Oct. 2010)

# Advisees & Graduates

**PhDs (7 graduated)**

Aadi Arnab

MSE, Expected 2026

Ariful Islam

ECE, Expected 2026

Haobo Yang

MSE 2021-2022 (dismissed)

Nathan Rock

MSE 2019-2025 expected

Jason Merrell

Interface Engineering in Crystal Growth Techniques

MSE, Dec 2022

Sudhajit Misra

Effects Of Post-Deposition Treatments On Grain Boundaries And Defects In Cadmium Telluride Solar Cells, ECE, (May 2020)

Mashaduddin Uddin Saleh

Photovoltaic String Monitoring Using Spread Spectrum Time Domain Reflectometry, ECE, (Dec. 2019)

Dennis S. Pruzan

Compositional Investigations of Thin Film Photovoltaic Materials, MSE, (May 2018)

Elizabeth A. Lund

Defect Characterization and Phase Analyses of Copper Zinc Tin Sulfide/Selenide, ChemE, (May 2014)

Ashish Bhatia

Laser Annealing and Defect Study of Chalcogenide Photovoltaic Materials, MSE, (May 2013)

James R. Nagel

Advanced Methods for Light Trapping in Optically Thin Silicon Solar Cells, ECE, (May 2011)

**Masters (14 graduated)**

Nathan Rock

MS, thesis, MSE pending

Isaac Thomas

MS, non-thesis MSE pending

Nathan Yonkee

MS, ECE, fall 2021

Brian Eisner

MS MSE, Spring 2021

Kyle Ahn

MS ECE, Spring 2021

Athena Shahrabi

MS, MSE, U Utah, (Dec. 2019)

Samuel Sprawls

MS, MSE, (Dec. 2019)

Kholoud Alajmi

MS, ECE, (May 2019)

Holly Mumford McCullough

MS, MSSST Program (Dec. 2018)

Joshua Winger

BS/MS, MSE (May 2019)

Jared Bunn

BS/MS, MSE (May 2019)

Anna Caruso

MS, ECE (May 2018)

Thomas Wilenski

BS/MS, ECE (May 2018)

Emily Timmins

BS/MS, MSE (May 2018)

Laura Treider

MS, ECE, U Utah (Dec. 2016)

Carina Hahn

BS/MS, MSE, U Utah (May 2016)

Alex H. Gibbs

Combinatorial Investigation of the Effects of Sodium on Cu2ZnSnSe4 Polycrystalline Thin Films, MS MSE U Utah, (May 2016)

Joseph G. Bolke

Investigation of Surface Phase Formation During Sn-Rich Growth of Cu2ZnSnS4 Polycrystalline Thin Films For Solar Cells, MS MSE U Utah, (2012)

Matthew M. Nowell – ME MSE, U Utah

Characterization of CdTe before and after CdCl2 Treatment by EBSD and Correlation with Device Parameters

**Postdocs & Visiting Scholars**

2019-2021, Rujun Sun, Postdoc (now professor at Xidian University, China)

2018-2019, Yukee Ooi, Postdoc

2016-2017, Rujun Sun, PhD Student, Tsinghua University, China

2015-2017, Akira Nagaoka, Postdoc, JSPS Fellowship. Now Assistant Prof. at University of Miyazaki, Japan

2014, Chalapathi Uppala, Sri Venkateswara UniversityTirupati, India

2013-2015, Mehmet Eray Erkan

2013-2014, Vipul Kheraj, Professor, SVNIT, India. Visited on Fullbright scholarship.

2012-2013, Junyi Zhu, Postdoc, now faculty at City University of Hong Kong

2012-2014, Brian Simonds. Now Scientist at NIST Boulder

2011-2013, Volodymyr Kosyak. Most recently researcher at Uppsala University, Sweden

2009-2011, Win-Maw Hlaing Oo

2009, Jan Mussener, PhD student, DAAD fellowship

**BS Honors**

Joshua Winger

MSE, (2019)

Carina Hahn

MSE, U Utah (2015)

Melinda Downs, Modeling Conductivity as a Function of Temperature for CZTS and CZTSe Thin Film Solar Cell Absorber Layers, MSE U Utah (2013)

**Undergraduate Research and Senior Projects (List Incomplete)**

Jonathan Wang, Stephanie Smith, Michael Lukowski, Henry Silverman – ECE students, Implementing Photocapacitance measurement system

Sabrina Lin, David Parker Mancuso, Anders Bleak, Porter Biehler – MSE senior project team on Ga refining

Eden Schow, Felix Ortiz, KD Dixson, Mcclain Wolfenbarger – Busines school team senior project scoping out business opportunities for Ga2O3 discrete devices

Henry Silverman, Eric Klossner 2023 – photoluminescence and voc modelling

Jason Sheets – undergrad RA Ga2O3 2022-2022

Jacob High – undergrad RA on ga2o3 – defect reactions in conducting to insulating transition with annealing

Becca Izzat, Monica Mahoney 2021

*Gene Siegel MSE Research, UROP, Senior Project 2008 – 2010*

*Joeseph Bolke MSE Research, UROP, Senior Project 2009 –*

*Paul Allred MSE Research, Senior Project 2009 – 2010*

*Paul Slusser MSE Research 2009 – 2010*

*Guy Miller*

*Arslan Majid ECE Research 2010 –*

*Silas Bennett Applied Physics, CalTech Summer Research 2010*

*Chris Hancock AMES High School Research Intern 2010*

***Published Conference Proceedings (>50)***

53 Effective Passivation of CdTe Rear Interface via Thin Selenium Interface Layer Indicated by Surface Photovoltage Spectroscopy

MA Scarpulla, ND Rock, A Munshi

2022 IEEE 49th Photovoltaics Specialists Conference (PVSC), 1086-1086 2022

52 Growth and defect characterization of doped and undoped β-Ga2O3 crystals

John S. McCloy, Jani Jesenovec, Benjamin L. Dutton, Christopher Pansegrau, Cassandra Remple, Marc H. Weber, Santosh Swain, Matthew McCluskey, Michael Scarpulla

Oxide-based Materials and Devices XIII 12002, 21-39 (2022)

51 Scale Transform Signal Processing for Reducing the Effect of Rain on SSTDR Signals

ZK Wilkerson, AS Edun, MA Scarpulla, CM Furse, JB Harley

2021 International Conference on Electromagnetics in Advanced Applications … 2021

50 A Nagaoka, K Nishioka, K Yoshino, D Kuciauskas, MA Scarpulla

Growth and Characterization of Arsenic-Doped CdTe 1− x Se x Single Crystals Grown by the Cd-Solvent Traveling Heater Method

Journal of Electronic Materials (2020). <https://doi.org/10.1007/s11664-020-08343-z>

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Rujun Sun, [Defect properties of SiO2 and Al2O3 in the metal oxide semiconductor capacitors of β-Ga2O3](https://event.fourwaves.com/icds31/abstracts/4b14ab73-43a4-48c7-9d57-3b9b6bae352b), ICDS-31 (Oslo, Norway/Virtual) July 2021

R. Sun, Y.K. Ooi, P. Ranga, M. Saleh, K.G. Lynn, S. Krishnamoorthy and M.A. Scarpulla

Chromium origins of red luminescence from Fe doped-Ga2O3 bulk crystals & Effects of Annealing on Electronic Defects in β-Ga2O3

PCSI Conference, Jan 20, 2020 Boulder CO

Yu Kee Ooi, Rujun Sun, Yunshan Wang, Xiaojuan Ni, Emmanuel Lotubai, Arkka Bhatacharayaa, Praneeth Ranga, Ting Zhang, Feng Liu, Steve Blair, Sriram Krishnamoorthy, Berardi Sensale-Rodriguez, Mike Scarpulla, Maud Saleh, Peter T. Dickens Kelvin Lynn, Joel Varley

PL in β-Ga2O3: Preservation of Incident Photon Linear Polarization and Wavelength Information by Oxygen Site-Specific Trapped Holes and Fe-related Emission

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Joel B. Harley, Ayobami Edun, Cody LaFlamme, Samuel Kingston, Evan Benoit, Michael Scarpulla, Cynthia Furse, "Spread Spectrum Time Domain Reflectometry for Health Monitoring of Solar Arrays," 47th Annual Review of Progress in Quantitative Nondestructive Evaluation, Minneapolis, MN, July 25-26, 2020

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Minority Carrier Defects in CZTSSe Solar Cells Characterized by DLTS

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SPIE Optics & Photonics, Conference 8823, San Diego, CA (Aug. 2013), paper 8823-1.

D.J.S. Hwang, Di Liu, Tao Zhang, M.A Karmarkar, and M.A. Scarpulla

Pulsed Laser Scribing Of Earth-Abundant Cu2ZnSnS4 Thin Film Solar Cells

SPIE Optics & Photonics, Conference 8826, San Diego, CA (Aug. 2013), paper 8826-14.

V. Kosyak, N.B. Mortazavi-Amiri, A.V. Postnikov, and M.A. Scarpulla

Native Point Defect Equilibrium in CZTS

MRS Spring Meeting, San Francisco, CA (May 2013)

V. Kosyak, A. Bhatia, I. Repins, S. Chen, N.B. Mortazavi Amiri, A.V. Postnikov, and M.A. Scarpulla,

A combined experimental and theoretical study of defect energy levels in Cu2ZnSnSe4 based solar cells

27th International Conference on Defects in Semiconductors, Bologna, Italy, (July 2013)

H. Meadows, A. Bhatia, P.J. Dale, and M.A. Scarpulla

Laser annealing of various CuInSe2 precursor structures
30th European MRS Spring Meeting, Strasbourg, France (May 2013), Symposium D

E.A. Lund and M.A. Scarpulla
Effects of off-stoichiometry and 2nd phases on Cu2ZnSn(S,Se)4 (CZTS) device parameters

SPIE Photonics West, Conference 8620, San Francisco, CA (Feb. 2013), paper 8620-42

J.R. Nagel, S. Blair, and M.A. Scarpulla
Exact field solution to guided wave propagation in lossy thin films

SPIE Photonics West, Conference 8256, San Francisco, CA (Jan. 2012)

A. Bhatia, H. Meadows, P.J. Dale, and M.A. Scarpulla

Solid Phase Laser Annealing of electrodeposited CuInSe2 Thin Films

SPIE XVI International Workshop on the Physics of Semiconductor Devices, Kanpur, India (Dec. 2011), paper PV19

A. Bhatia, M.A. Karmarkar, P.J. Dale, and M.A. Scarpulla

Grain growth study of electrochemically deposited CuInSe2 by rapid thermal annealing in sulfur atmosphere

SPIE XVI International Workshop on the Physics of Semiconductor Devices, Kanpur, India (Dec. 2011), paper PV19

J.R. Nagel and M.A. Scarpulla

Electromagnetic Wave Propagation in Lossy Thin Films

NanoUtah Conference, Salt Lake City, UT (Oct. 2011)

A. Majid, S. Edalatpour, M. Francoeur, and M.A. Scarpulla

Simulations of Plasmonic Phase Change Oscillators

NanoUtah Conference, Salt Lake City, UT (Oct. 2011)

K. Hartman, B.K. Newman, V. Chawla, P.A. Fernandes, H. Du, J.L. Johnson,T. Bolin, M.A. Scarpulla, G. Teeter, A.F. da Cunha, B.M. Clemens, and T. Buonassisi
[Detection of ZnS Phases in CZTS Thin-Films by EXAFS](http://ieee-pvsc.org/ePVSC/planner_public/index.php)
37th IEEE Photovoltaic Specialists Conference, Seattle, WA (Jun. 2011)

J.R. Nagel and M.A. Scarpulla

Design Principles for Light-Trapping in Thin Silicon Films with Embedded Dielectric Nanoparticles

TMS Electronic Materials Conference, Santa Barbara, CA (Jun. 2011)

A. Bhatia, W.M. Hlaing Oo, G. Siegel, P.R. Stone, K.M. Yu, and M.A. Scarpulla

Synthesis of Ge(1-x)Snx Alloy Thin Films Using Ion-Implantation and Pulsed Laser Melting (II-PLM)

TMS Electronic Materials Conference, Santa Barbara, CA (Jun. 2011)

H. Du, M. Young, F. Yan, S. Johnstone, W.M. Hlaing Oo, E.A. Lund, M.A. Scarpulla and G. Teeter

Effects of Composition on Thin-film Cu2ZnSnS4 Material Properties.

MRS Spring Meeting, San Francisco, CA (Apr. 2011)

K. Hartman, J.L. Johnson, M.A. Scarpulla, and T. Buonassisi

Gwth of Tin Monosulfide (SnS) Thin-films by RF Sputtering and Post-deposition Annealing

MRS Spring Meeting, San Francisco, CA (Apr. 2011)

J.L. Johnson, M.A. Karmarkar, W.M. Hlaing Oo, L.W. Reith, and M.A. Scarpulla

Cu2ZnSnS4 and Mo Annealing by Rapid Thermal Annealing and Its Effects on Grain Growth and Cell Performance

MRS Spring Meeting, San Francisco, CA (Apr. 2011)

J.R. Nagel and M.A. Scarpulla

Enhanced Light-Trapping in Thin-Film Silicon Solar Cells Via Embedded Dielectric Nanoparticles

NanoUtah Conference, Salt Lake City, UT (Oct. 2010)

[1st Prize Winner for Best Presentation in Energy, Catalysis, and Environment Category].

M.A. Scarpulla, T.E. Buehl, B. Mellot, R.V. Chopdekar, K.M. Yu, R. Farshchi, A.C. Gossard

Properties of MBE-grown layers of III-V arsenides with embedded ErAs nanoparticles

North American Molecular Beam Epitaxy Conference, Brekenridge, CO (Sept. 2010)

(MAS worked on this topic at U Utah with students and presented these results)

J.L. Johnson, H. Nukala, A. Bhatia, E.A. Lund, W. M. Hlaing Oo, L.W. Reith, and M.A. Scarpulla

Cu2ZnSnS4 Photovoltaic Absorber Layers Deposited by RF Sputtering from Binary Targets

TMS Electronic Materials Conference, Notre Dame, IN (Jun. 2010)

J.R. Nagel and M.A. Scarpulla

Enhanced Light Absorption in Thin-Film Silicon Solar Cells by Scattering from Sub-Surface Dielectric Nanoparticles

TMS Electronic Materials Conference, Notre Dame, IN (Jun. 2010)

A. Bhatia, P.J. Dale, M.M. Nowell, M. A. Scarpulla

Pulsed laser processing of electrodeposited CuInSe2 photovoltaic absorber thin films

MRS Spring Meeting, San Francisco, CA (Apr. 2010)

H. Nukala, J.L. Johnson, A. Bhatia, E.A. Lund, W.M. Hlaing Oo, M.M. Nowell, L.W. Rieth, and M.A. Scarpulla

Synthesis of optimized CZTS thin films for photovoltaic absorber layers by sputtering from sulfide targets and sulfurization

MRS Spring Meeting, San Francisco, CA (Apr. 2010)

J.L. Johnson­, H. Nukala­, E.A. Lund­, W.M. Hlaing Oo, A. Bhatia, L.W. Rieth­, M.A. Scarpulla

Effects of 2nd phases, stress, and Na at the Mo/Cu2ZnSnS4 interface

MRS Spring Meeting, San Francisco, CA (Apr. 2010)

J.R. Nagel and M.A. Scarpulla

Simulated Optical Absorption of Plasmon-Enhanced Thin-Film Silicon Solar Cells

NanoUtah Conference, Salt Lake City, UT (Oct. 2009)

L.A. Lund, J.R. Nagel, K.M. Alberi, and M.A. Scarpulla

Plasmonic Nanosphere Enhanced Thin Film Si Solar Cells

NanoUtah Conference, Salt Lake City, UT (Oct. 2009)

***Poster Presentations***

Evan Benoit, Naveen Kumar Tumkur Jayakumar, Samuel Kingston, Mashad Uddin Saleh, Michael Scarpulla, Joel Harley, Cynthia Furse, "Applicability of SSTDR Analysis of Complex Loads" (accepted to IEEE APS URSI 2019).

Mashad Uddin Saleh, Christopher Deline, Naveen Kumar, Evan Benoit, Samuel Kingston, Joel Harley, Cynthia Furse, Mike Scarpulla, "Detection and Localization of Disconnections in PV Strings Using SSTDR", 2019 NREL PV Reliability Workshop, Feb 26-28, 2019, Lakewood, CO, USA.

Samuel Kingston, Ayobami Edun, Evan Beniot, Naveen K. T. Jayakumar, Mashad U. Saleh, Cynthia M. Furse, Michael A. Scarpulla, Joel B. Harley, "Simulating the Spread Spectrum Time Domain Reflectometry Responses of Photovoltaic Cells to Detect and Locate Faults", 2019 NREL PV Reliability Workshop, Feb 26-28, 2019, Lakewood, CO, USA.

Evan Benoit, Naveen Kumar Tumkur Jayakumar, Samuel Kingston, Mashad U. Saleh, Michael Scarpulla, Joel B. Harley, Cynthia Furse, "Spread Spectrum Time Domain Reflectometry for Complex Impedance Fault Detection", 2019 NREL PV Reliability Workshop, Feb 26-28, 2019, Lakewood, CO

A.E. Caruso, E.A. Lund, V. Kosyak, D.S. Pruzan, C. Miskin, R. Agrawal, C. Beall, I.

Repins, and M.A. Scarpulla

Defect Characterization of Co-Evaporated and Solution-Deposited Cu2ZnSn(SxSe1-x)4

43rd IEEE Photovoltaic Specialists Conference, Portland, OR (Jun. 2016). DOI:

Sudhajit Misra, Mitchell C. Hymas, Elizabeth A. Lund, and Michael A. Scarpulla

Chemical Bath Deposition and Laser Annealing: A Low Cost Fast Process for Depositing CdTe Thin Films

43rd IEEE Photovoltaic Specialists Conference, Portland, OR (Jun. 2016). DOI:

V. Kheraj, E.A. Lund, A.E. Caruso, K. Al-Ajmi, D. Pruzan, C. Miskin, R. Agrawal, C. Beall, I. Repins, and M.A. Scarpulla

Minority Carrier Electron Traps in CZTSSe Solar Cells Characterized by DLTS and DLOS

43rd IEEE Photovoltaic Specialists Conference, Portland, OR (Jun. 2016). DOI:

D.S. Pruzan, C.E. Hahn, S. Misra, and M.A. Scarpulla

A Method for Depositing CdTe from Aqueous Solution

43rd IEEE Photovoltaic Specialists Conference, Portland, OR (Jun. 2016). DOI:

B. Simonds, M.A. Scarpulla, V. Palekis, and C. Ferekides

Laser Processing to Improve CdTe Thin Film Photovoltaics Efficiency and Manufacturing

DOE Sunshot Thin Film PV Workshop, University of Delaware, Newark, DE (Oct 2013)

A. Caruso, D. Pruzan, E.A. Lund, E. Erkan, V. Kheraj, A. Nagaoka, K. Yoshino, I. Repins, C. Beall, H. Guthrey, M. Al-Jassim, H. Moutinho, C. Miskin, R. Agrawal, M. A. Scarpulla

Electrical Defect Characterization of CZTSSe

DOE Sunshot Thin Film PV Workshop, University of Delaware, Newark, DE (Oct 2013)

B. Simonds, M.A. Scarpulla, and C. Ferekides

Laser Processing to Improve CdTe Thin Film Photovoltaics Efficiency and Manufacturing

Bay Area PV Consortium Semiannual Meeting, Berkeley, CA (Oct 2013)

Helene J. Meadows, David Regesch, Sudhajit Misra, Brian J. Simonds, Mike A. Scarpulla, Viktor Gerliz, Levent Gütay, Phillip J. Dale

The Importance of Selenium Partial Pressure in the Laser Annealing of CuInSe2 Precursors

40th IEEE Photovoltaic Specialists Conference, Denver, CO (Jun. 2014)

B. J. Simonds, V. Palekis, B. van Devener, C.A. Ferekides, M.A. Scarpulla

Te-rich CdTe Surface by Pulsed UV Laser Treatment for Ohmic Back Contact Formation

40th IEEE Photovoltaic Specialist Conference, Denver, CO (June 2014)

Vasilios Palekis, Brian J. Simonds, Md Khan, Vamsi Evani, Michael A. Scarpulla, Chris Ferekides

High Throughput Laser Processing for the Formation of Ohmic Contacts to CdTe Solar Cells

40th IEEE Photovoltaic Specialist Conference, Denver, CO (June 2014)

A. E. Caruso, D.S. Pruzan, V. Kosyak, A. Bhatia, E. A. Lund, C. Beall, I. Repins, M. A. Scarpulla

Temperature Dependence of Equivalent Circuit Parameters Used to Analyze Admittance Spectroscopy and Application to Cases of Dopant Freezeout Such as CZTSSe

40th IEEE Photovoltaic Specialist Conference, Denver, CO (June 2014)

B. Simonds, M.A. Scarpulla, and C. Ferekides

Laser Processing to Improve CdTe Thin Film Photovoltaics Efficiency and Manufacturing

Bay Area PV Consortium Semiannual Meeting, Stanford, CA (May 2013)

B. Simonds, M.A. Scarpulla, and C. Ferekides

Laser Processing to Improve CdTe Thin Film PV Efficiency and Manufacturing

Bay Area PV Consortium Semiannual Meeting, Berkeley, CA (Oct. 2012)

A. Bhatia, M.A. Karmarkar, H. Meadows, M.C. Hymas, E.M. Smith, P.J. Dale, and M.A. Scarpulla

Effects of annealing in sulfur vapor on electrodeposited CuInSe2 films

38th IEEE Photovoltaic Specialists Conference, Austin TX (June 2012)

A. Bhatia, H. Meadows, M.C. Hymas, E.M. Smith, P.J. Dale, and M.A. Scarpulla

Study of point defects in ns pulsed-laser annealed CuInSe2 thin films

38th IEEE Photovoltaic Specialists Conference, Austin TX (June 2012)

J.R. Nagel and M.A. Scarpulla

Equivalent Deflection Angle of Textured Surfaces
38th IEEE Photovoltaic Specialists Conference, Austin TX (June 2012)

J.R. Nagel and M.A. Scarpulla

[*Enhanced Light Absorption in Thin-Film Silicon Solar Cells by Scattering from Embedded Dielectric Nanoparticles*](http://ieee-pvsc.org/ePVSC/planner_public/index.php)37th IEEE Photovoltaic Specialists Conference, Seattle, WA (Jun. 2011)

M.M. Nowell, M.A. Scarpulla, A.D. Compaan, X. Liu, D. Kwon, and K.A. Wieland

[*Electron Backscatter Diffraction and Photoluminescence of Sputtered CdTe Thin Films*](http://ieee-pvsc.org/ePVSC/planner_public/index.php)37th IEEE Photovoltaic Specialists Conference, Seattle, WA (Jun. 2011)

A. Bhatia, H. Meadows, W.M. Hlaing Oo, P.J. Dale, and M.A. Scarpulla
[*Pulsed Laser Processing of Electrodeposited CuInSe2 Photovoltaic Absorber Thin Films*](http://ieee-pvsc.org/ePVSC/planner_public/index.php) 37th IEEE Photovoltaic Specialists Conference, Seattle, WA (Jun. 2011)

J.R. Nagel and M.A. Scarpulla

*Enhanced Light-trapping in Thin-film Silicon Solar Cells Via Scattering from Embedded Nanoparticles*

MRS Spring meeting, San Francisco (April 2011)

M.A. Scarpulla, L.W. Rieth, W.M. Hlaing Oo, J.L. Johnson, E.A. Lund, M. Karmarkar

*SISGR: Fundamental studies of unconventional sulfide semiconductors for cost-effective and environmentally-benign thin film photovoltaics*

DOE BES Contractors Meeting, Airlie VA (Mar. 2011)

M.A. Scarpulla, W.M. Hlaing Oo, E.A. Lund, A. Bhatia, J.L. Johnson, L.W. Rieth, K. Hartman, T. Buonassisi, and M.M. Nowell

*Commodity Element Sulfide Semiconductors for Thin Film Photovoltaic Scale-Up*

MRS Workshop on Photovoltaic Materials and Manufacturing Issues, Denver CO (Oct. 2010)

J.R. Nagel and M.A. Scarpulla

*Enhanced light absorption in optically-thin solar cells*

MRS Workshop on Photovoltaic Materials and Manufacturing Issues, Denver CO (Oct. 2010)

J.R. Nagel and M.A. Scarpulla

Simulated Optical Absorption of Plasmon-Enhanced Thin-Film Silicon Solar Cells

NanoUtah Conference, Salt Lake City, UT (Oct. 2010)

E.A. Lund, J.L. Johnson, H. Nukala, W.M. Hlaing Oo, and M.A. Scarpulla

*Fundamental study of CSTS: A novel semiconductor for economical and environmentally-benign thin film photovoltaics*

IEEE 35th Photovoltaic Specialists Conference, Waikiki, HI (June 2010)

A. Bhatia, P.J. Dale, M.M. Nowell, and M.A. Scarpulla

*Pulsed laser processing of electrodeposited CuInSe2 photovoltaic absorber thin films*

European MRS Spring meeting, Strasbourg (June 2010)

K. Hartman, J.L. Johnson, M. Bertoni, M.A. Scarpulla, and T. Buonassisi

*RF sputtering of tin sulfide (SnS) at room temperature for thin film solar cell applications*

European MRS Spring meeting, Strasbourg (June 2010)

# M.A. Scarpulla Publications from Affiliations Prior to UUtah

***Patents***

Q. Dai *et al.*, US 6,586,070 B1, *Thin Film TiSixNy Protective Layer*

***Book Chapters***

K.M. Yu, M.A. Scarpulla, W. Shan, J. Wu, J.W. Beeman, J. Jasinski, Z. Liliental-Weber, O.D. Dubon, and W. Walukiewicz

*Energetic Beam Synthesis of Dilute Nitrides and Related Alloys*

*Dilute III-V Nitride Semiconductors and Material Systems*, A. Erol, Ed.

Springer Series in Materials Science **105** (Springer; Berlin 2008), pp. 1-34.

Peter R. Stone, Oscar D. Dubon, Michael A. Scarpulla, and Kin Man Yu

*Ga1-xMnxP Synthesized by Ion Implantation and Pulsed-Laser Melting*

Handbook of Semiconductor Spintronics, W.M. Chen and I.A. Buyanova, Eds.

(Pan Stanford Publishing; Singapore, 2010), pp. 157-176.

***Peer Reviewed Articles***

45 T. Kim, M.R. Pillai, M.J. Aziz, M.A. Scarpulla, O.D. Dubon, K.M. Yu, J.W. Beeman, and M.C. Ridgway

*Heat flow model for pulsed laser melting and rapid solidification of ion implanted GaAs*

Journal of Applied Physics, **108** 013508(2010). <http://dx.doi.org/10.1063/1.3457106>

44 W. Yi, V. Narayanamurti, H. Lu, M.A. Scarpulla, and A.C. Gossard

*Probing semiconductor band structures and heterojunction interface properties with ballistic carrier emission: GaAs/AlxGa1-xAs as a model system*

Physical Review B **81** 235325(2010)

43 T.E. Buehl, J.M. LeBeau, S. Stemmer, M.A. Scarpulla, C.J. Palmstrøm and A.C. Gossard

*Growth of embedded ErAs nanorods on (4 1 1)A and (4 1 1)B GaAs by molecular beam epitaxy*

Journal of Crystal Growth **312** (14) 2089-2092 (2010)

42 [Y.Y. Zhou](http://scitation.aip.org/vsearch/servlet/VerityServlet?KEY=ALL&possible1=Zhou%2C+Y.+Y.&possible1zone=author&maxdisp=25&smode=strresults&aqs=true), [X. Liu](http://scitation.aip.org/vsearch/servlet/VerityServlet?KEY=ALL&possible1=Liu%2C+X.&possible1zone=author&maxdisp=25&smode=strresults&aqs=true), [J.K. Furdyna](http://scitation.aip.org/vsearch/servlet/VerityServlet?KEY=ALL&possible1=Furdyna%2C+J.+K.&possible1zone=author&maxdisp=25&smode=strresults&aqs=true), [M.A. Scarpulla](http://scitation.aip.org/vsearch/servlet/VerityServlet?KEY=ALL&possible1=Scarpulla%2C+M.+A.&possible1zone=author&maxdisp=25&smode=strresults&aqs=true), and [O.D. Dubon](http://scitation.aip.org/vsearch/servlet/VerityServlet?KEY=ALL&possible1=Dubon%2C+O.+D.&possible1zone=author&maxdisp=25&smode=strresults&aqs=true)

*Ferromagnetic Resonance Study of Ga1-xMnxAs Fabricated on (311) GaAs Wafers by Mn Ion Implantation and Pulsed-Laser Melting*

Journal of Superconductivity and Novel Magnetism **23** (1) 87-90, (2010)

41 Y.Y. Zhou, X. Liu, J.K. Furdyna, M.A. Scarpulla, and O.D. Dubon

*Ferromagnetic resonance investigation of magnetic anisotropy in Ga1-xMnxAs synthesized by ion implantation and pulsed laser melting*

Physical Review B **80**, 224403 (2009)

40 G. Acbas, M.-H. Kim, M. Cukr, V. Novak, M. A. Scarpulla, O. D. Dubon, T. Jungwirth, J. Sinova, and J. Cerne

*Electronic structure of ferromagnetic semiconductor Ga1-xMnxAs probed by sub-gap magneto-optical spectroscopy*

Physical Review Letters **103** 137201 (2009)

39 W. Yi, V. Narayanamurti, H. Lu, M.A. Scarpulla, and A.C. Gossard

 *Bandgap and Band Offsets Determination of Semiconductor Heterostructures using Three-terminal Ballistic Carrier Spectroscopy*

Applied Physics Letters **95** 112102 (2009)

38 M.A. Scarpulla, C.S. Gallinat, S. Mack, J.S. Speck, and A.C. Gossard

*GdN (111) heteroepitaxy on GaN (0 0 01) by N2 plasma and NH3 molecular beam epitaxy*

Journal of Crystal Growth **311** 1239 (2009)

37 P.R. Stone, C. Bihler, M. Kraus, M.A. Scarpulla, J.W. Beeman, K.M. Yu, M.S. Brandt, and O.D. Dubon

*Compensation-dependent in-plane magnetization reversal processes in Ga1-xMnxP1-ySy*

Physical Review B **78** 214421 (2008)

36 Y.J. Cho, M.A. Scarpulla, Y.Y. Zhou, Z. Ge, X. Liu, M. Dobrowolska, K.M. Yu, O.D. Dubon, and J.K. Furdyna

*Magnetic anisotropy of Ga1-xMnxAs formed by ion implantation and pulsed laser melting*

Journal of Applied Physics **104** 043902 (2008)

35 C. Bihler, M. Kraus, M.S. Brandt, S.T.B. Goennenwein, M. Opel, M.A. Scarpulla, R. Farshchi, D.M. Estrada, and O.D. Dubon

*Suppression of hole mediated ferromagnetism in Ga1-xMnxP by hydrogen*

Journal of Applied Physics **104** 013908 (2008)

34 M.A. Scarpulla, P.R. Stone, I.D. Sharp, E.E. Haller, O.D. Dubon, J.W. Beeman, and K. M. Yu

*Non-magnetic compensation in ferromagnetic Ga1-xMnxAs and Ga1-xMnxP synthesized by ion implantation and pulsed-laser melting*

Journal of Applied Physics **103** 123906 (2008) doi:10.1063/1.2940361

33 M.A. Scarpulla, J.M.O. Zide, J.M. LeBeau, C.G. van de Walle, A.C. Gossard, and K.T. Delaney

*Near-infrared absorption and semimetal-semiconductor transition in 2 nm ErAs nanoparticles embedded in GaAs and AlAs*

Applied Physics Letters **92** 173116 (2008)

32 M.A. Scarpulla, R. Farshchi, P.R. Stone, R.V. Chopdekar, K.M. Yu, Y. Suzuki, and O.D. Dubon *Electrical transport and ferromagnetism in Ga1-xMnxAs synthesized by ion implantation and pulsed-laser melting (II-PLM)*

Journal of Applied Physics **103** 073913 (2008)

31 G. Acbas, J. Sinova, M.A. Scarpulla, O.D. Dubon, M. Cukr, V. Novak, and J. Cerne

*Comparison of the mid-infrared magneto-optical response of Ga(1-x)Mn(x)As films grown by molecular beam epitaxy and ion implantation and pulsed laser melting*

Journal of Superconductivity and Novel Magnetism **20** (6) 457-460 (2007)

30 K.M. Yu, M.A. Scarpulla, R. Farshchi, O.D. Dubon, and W. Walukiewicz

*Synthesis of highly mismatched alloys using ion implantation and pulsed laser melting*

Nuclear Instruments & Methods in Physics Research Section B **261** 1150 (2007)

29 M.-H. Kim, G. Acbas, M.-H. Yang, I. Ohkubo, H. Christen, D. Mandrus, M.A. Scarpulla, O.D. Dubon, Z. Schlesinger, P. Khalifah, and J. Cerne

*Determination of the infrared complex magnetoconductivity tensor in itinerant ferromagnets from Faraday and Kerr measurements*

Physical Review B **75** 214416 (2007)

28 C. Bihler, M. Kraus, H. Huebl, M. S. Brandt, S.T.B. Goennenwein, M. Opel, M.A. Scarpulla, P.R. Stone, R. Farshchi, and O. D. Dubon

*Magnetocrystalline anisotropy and magnetization reversal in Ga1-xMnxP synthesized by ion implantation and pulsed-laser melting*

Physical Review B **75** 214419 (2007)

27 P. R. Stone, M.A. Scarpulla, R. Farshchi, I.D. Sharp, E.E. Haller, O.D. Dubon, K.M. Yu, J.W. Beeman, E. Arenholz, J.D. Denlinger, H. Ohldag

*Mn L3,2 X-ray Absorption Spectroscopy And Magnetic Circular Dichroism In Ferromagnetic Ga1-xMnxP*

AIP Conf. Proc. **893**, 1177 (2007) [28th International Conference on the Physics of Semiconductors]

26 Y.J. Cho *et al*., *Magnetic cluster phases of Mn-interstitial-free (Ga,Mn)As*

AIP Conf. Proc. **893**, 1221 (2007) [28th International Conference on the Physics of Semiconductors]

25 R. Farshchi, M.A. Scarpulla, P.R. Stone, K.M. Yu, I.D. Sharp, J.W. Beeman, H.H. Silvestri, L.A. Reichertz, E.E. Haller, and O.D. Dubon

*Compositional tuning of ferromagnetism and electronic transport in Ga1-xMnxP*

Solid State Communications **140** (9-10) 443 (2006)

24 P.R. Stone, M.A. Scarpulla, R. Farshchi, I.D. Sharp, E.E. Haller, O.D. Dubon, K.M. Yu, J.W. Beeman, E. Arenholz, J.D. Denlinger, H. Ohldag

*Mn L3,2 X-ray absorption and magnetic circular dichroism in ferromagnetic Ga1-xMnxP*

Applied Physics Letters **89** 012504 (2006)

23 O.D. Dubon, M.A. Scarpulla, R. Farshchi, and K.M. Yu

*Doping and defect control of ferromagnetic semiconductors formed by ion implantation and pulsed-laser melting*

Physica B **376-377** 630 (2006)

22 Michael A. Scarpulla, Benjamin L. Cardozo, Rouin Farshchi, Win Maw Hlaing Oo, Matthew D. McCluskey, Kin Man Yu, and Oscar D. Dubon

*Ferromagnetism in Ga1-xMnxP: Evidence for Inter-Mn Exchange Mediated by Localized Holes within a Detached Impurity Band*

Physical Review Letters **95** 207204 (2005) . >120 citations as of 2020

21 M.A. Scarpulla, K.M. Yu, W. Walukiewicz, and O.D. Dubon

*Carrier Concentration Dependencies of Magnetization & Transport in Ga1-xMnxAs1-yTey*

AIP Conf. Proc. **772** 1367 (2005) [27th International Conference on the Physics of Semiconductors]

20 K.M. Alberi, A. Minor, M.A. Scarpulla, S. Chung, D.E. Mars, K.M. Yu, W. Walukiewicz, and O.D. Dubon

*Fabrication of GaNxAs1-x Quantum Structures by Focused Ion Beam Patterning*

AIP Conf. Proc. **772**, 223 (2005) [27th International Conference on the Physics of Semiconductors]

19 O.D. Dubon, M.A. Scarpulla, K.M. Yu, and W. Walukiewicz

*Diluted semiconductors formed from energetic beams*

IOP Conference Series **184** 399 (2005) [Compound Semiconductors 2004]

18 K.M. Yu, W. Walukiewicz, T. Wojtowicz, J. Denlinger, M.A. Scarpulla, X. Liu, and J.K. Furdyna

*Effect of film thickness on the incorporation of Mn interstitials in Ga1-xMnxAs*

Applied Physics Letters **86** (4) 042102 (2005)

17 K.M. Yu, W. Walukiewicz, W. Shan, J. Wu, J.W. Beeman, M.A. Scarpulla, O.D. Dubon, and P. Becla

*Synthesis and optical properties of II-O-VI highly mismatched alloys*

Journal of Applied Physics **95** (11) 6232-6238 (2004)

16 K.M. Yu, W. Walukiewicz, M.A. Scarpulla, O.D. Dubon, W. Shan, J. Wu, J.W. Beeman and P. Becla *Synthesis and properties of highly mismatched II–O–VI alloys*

IEEE Proceedings-Optoelectronics **151** (5) 452-459 (2004)

15 K.M. Yu, W. Walukiewicz, J. Wu, W. Shan, M.A. Scarpulla, O.D. Dubon, J.W. Beeman, and P. Becla

*Diluted ZnMnTe oxide: a multi-band semiconductor for high efficiency solar cells*

Physica Status Solidi. B **241** (3) 660-663 (2004)

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*Mutual passivation of group IV donors and isovalent nitrogen in diluted GaNxAs1-x alloys*

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*New methodologies for measuring film thickness, coverage, and topography*

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1 C.A. Santos, B.D. Freedman, K.J. Leach, D.L. Press, M.A. Scarpulla, E. Mathiowitz

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***Invited Presentations***

M.A. Scarpulla *et al.*

*Epitaxial Integration of Rare Earth Pnictides in III-V Semiconductors*

Materials Research Society Fall Meeting, Boston, MA (Dec. 2010)

M.A. Scarpulla

*Epitaxial Films of Unconventional Dilute Semiconductor Alloys*

MSE Department Seminar, Ohio State University (Apr. 2008)

M.A. Scarpulla

*Epitaxial Films of Unconventional Dilute Semiconductor Alloys*

ECE & MSE Department Seminars, University of Utah (Mar. 2008)

M.A. Scarpulla

*III-V Ferromagnetic Semiconductors Synthesized Using Ion Implantation and Pulsed-Laser Melting*

MBE Seminar, University of California Santa Barbara, Santa Barbara, CA (Oct. 2006)

M.A. Scarpulla

*III-V Ferromagnetic Semiconductors Formed by Ion Implantation and Pulsed-Laser Melting*

Materials Science Seminar, Boise State University, Boise, ID (Sep. 2006)

M.A. Scarpulla

*Using Ion Implantation and Pulsed-Laser Melting to Synthesize III-Mn-V Ferromagnetic Semiconductors*

Applied Physics Brown Bag, Harvard University DEAS, Cambridge, MA (Jul. 2006)

M.A. Scarpulla

*Localized and Delocalized States & III-Mn-V Ferromagnetic Semiconductors Synthesized by Ion Implantation and Pulsed-Laser Melting*

Schottky Seminar, Walter Schottky Institute, Munich, Germany (Feb. 2006)

***First Authored Contributed Conference Presentations***

M.A. Scarpulla *et al.*

*Properties of 2 nm-Diameter ErAs Nanoparticles Embedded in GaAs*

Materials Research Society Spring Meeting, San Fransisco, CA (Apr. 2009)

M.A. Scarpulla *et al.*

*MBE growth of gadolinium nitride and integration with GaN*

7th International Conference on Nitride Semiconductors, Las Vegas, NV (Sept. 2007)

M.A. Scarpulla *et al.*

*Infrared Plasmon Resonance in Semimetallic Rare Earth-V / III-V Semiconductor Composite Materials*

TMS Electronic Materials Conference, Notre Dame, IN (June 2007)

M.A. Scarpulla *et al.*

*Plasmon Resonance in Rare Earth-V / III-V Semiconductor Composite Materials*

Frontiers of Nanoscience and Technology, Tokyo, Japan (Mar. 2007) *[poster]*

M.A. Scarpulla *et al.*

*Large spin polarization in Ga1-xMnxP synthesized by ion implantation and pulsed-laser melting (II-PLM)*

American Physical Society March Meeting, Baltimore, MD (Mar. 2006)

M.A. Scarpulla *et al.*

*Properties of ferromagnetic Ga1-xMnxP thin films synthesized by ion implantation and pulsed-laser melting*

50th Magnetism and Magnetic Materials Conference, San Jose, CA (Oct. 2005)

M.A. Scarpulla *et al.*

*Ferromagnetism in Ga1-xMnxP mediated by localized carriers in an impurity band*

SPINTECH-III, Awaji Island, Hyogo, Japan (Aug. 2005) *[poster]*

M.A. Scarpulla *et al.*

*A Ferromagnetic III-Mn-V Semiconductor with localized carriers: Ga1-xMnxP*

American Physical Society March Meeting, Los Angeles, CA (Mar. 2005)

M.A. Scarpulla *et al.*

*Ferromagnetic Semiconductors Synthesized by Ion Implantation & Pulsed-Laser Melting*

International Conference on Physics of Semiconductors, Flagstaff, AZ (Jul. 2004) *[poster]*

M.A. Scarpulla *et al.*

*Ga1-xMnxAs1-yTey Synthesized by Ion Implantation & Pulsed Laser Melting*

American Physical Society March Meeting, Montreal, Canada (Mar. 2004)

M.A. Scarpulla *et al.*

*III-V Diluted Magnetic Semiconductors Formed by Ion Implantation & Pulsed Laser Melting*

International Conference on Defects in Semiconductors, Aarhus, Denmark (Jul. 2003)

M.A. Scarpulla *et al.*

*Structure and Properties of Ferromagnetic III-Mn-V Films Formed by Ion Implantation and Pulsed Laser Melting*

Materials Research Society Fall Meeting, Boston, MA (Dec. 2002)

M.A. Scarpulla *et al.*

*Ferromagnetic Ga1-xMnxAs & Ga1-xMnxAs1-yCy Synthesized by Ion Implantation & Pulsed Laser Melting*

TMS Electronic Materials Conference, Santa Barbara, CA (Jun. 2002)

M.A. Scarpulla and C.M. Mate

*Mobility and Structure of Molecularly-Thin Lubricant Films*

American Vacuum Society Annual Meeting, San Francisco, CA (Oct. 2001)

M.A. Scarpulla and C.M. Mate

*Pushing perfluoropolyether molecules across surfaces using air shear*

American Chemical Society Annual Meeting, San Diego, CA (Mar. 2001)

***Other Conference Proceedings***

Toledo, N.G.; Cruz, S.C.; Neufeld, C.J.; Lang, J.R.; Scarpulla, M.A.; Buehl, T.; Gossard, A.C.; Denbaars, S.P.; Speck, J.S.; Mishra, U.K.

Integrated non-III-nitride/III-nitride tandem solar cell

Device Research Conference (DRC) (2011), pages 265-266, DOI: 10.1109/DRC.2011.5994525

N. Toledo, C. Neufeld, M.A. Scarpulla, T. Buehl, S. Cruz, A.C. Gossard, S. Denbaars, J. Speck, and U. Mishra

*Wafer Bonded GaAs-Sapphire for Photovoltaic Applications via Adhesive Bonding*

TMS Electronic Materials Conference, Santa Barbara, CA (Jun. 2011)

W. Walukiewicz, K.M. Yu, J. Wu, J.W. Ager III, W. Shan, M.A. Scarpulla, and O.D. Dubon, and P. Becla

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K.M. Yu, W. Walukiewicz, J. Wu, D.E. Mars, M.A. Scarpulla, O.D. Dubon, M.C. Ridgway, and J.F. Geisz

*Mutual Passivation in Dilute GaNxAs1-x Alloys*

MRS Symposium Proceedings 864 (2005) E8.1.1

W. Shan, W. Walukiewicz, K.M. Yu, J.W. Ager III, J. Wu, J. Beeman, M.A. Scapulla, O.D. Dubon, E. E. Haller, Y. Nabetani, and P. Becla

*Effect of oxygen on the electronic band structure of II-O-VI alloys*

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