

PERSONAL INFORMATION

Department of Physics
Penn State Altoona
3000 Ivyside Park
Altoona, PA 16601

QUALIFICATION

Experience experimental condensed matter physicist with extensive knowledge in engineering advanced nanomaterials, their application in new technologies and the nanoscale physics that stem from quantum phenomena in these nanostructures. I have demonstrated expertise in multi-disciplinary research projects in nanostructures (nanotubes, nanowires, carbide derived carbon, carbon nanofiber), sensors, energy storage, thermoelectric, spectroscopy, quantum transport and advanced CNT-metal composites.

Providing innovations, solutions and know-how in:

- ❖ Nanomaterials synthesis and nanomaterials engineering
- ❖ Chemical processing and functionalization of nanostructural materials
- ❖ Carbon nanotube, nanofibers and carbide derived carbon technologies
- ❖ Transparent conducting films
- ❖ Advanced CNT-metal matrix composites
- ❖ Nanowire technologies
- ❖ Energy storage technologies
- ❖ Sensor technologies
- ❖ Optics and optical spectroscopy
- ❖ IR, visible and UV Raman spectroscopy of nanostructures
- ❖ Nanostructure thermoelectrics
- ❖ Confinement phenomena in nanostructures
- ❖ Electrical transport in nanostructure
- ❖ Analytical instrumentation

PROFESSIONAL EXPERIENCE

Core Expertise

- ***Nanostructural materials studies***
 - Design and build chemical vapor deposition (CVD), pulsed laser vaporization (PLV), PL-CVD, thermal batch process (TBP) and arc discharge nanostructure synthesis systems

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- Synthesis of nanostructures (nanotubes, nanowires, nanofibers, carbide derived carbons, nanowire superlattice, twinning superlattice, dots and anti-dots nanowires) using chemical vapor deposition (CVD), pulsed laser vaporization (PLV), PL-CVD, thermal batch process (TBP) and arc discharge.
 - Nano-engineering of nanomaterials via chemical processing and functionalization
 - Develop hybrid CNT (metal infiltrated and metal coated) to tune metallic and semiconducting characteristics
 - Develop models to elucidate on confinement phenomena in nanostructures
 - Optical spectroscopy of nanostructures
 - Raman scattering in nanostructures
 - Thermoelectric properties of nananostructure
 - Transport properties of nanostructures
 - Fabrication of advanced lightweight CNT-metal matrix composites
 - CNT base transparent conducting films for touch screen and flat panel technologies
 - Fabrication of thin films of nanostructures for sensor applications
 - Thermal and thermophysical properties (thermal conductivity, specific heat and coefficient of thermal expansion) of CNT-metal matrix composites
 - Mechanical properties (tensile strength, elastic modulus, flexural modulus elongation) of CNT-metal matrix composites
 - Pore size distribution and porosity (surface area and pore volume) of nanomaterials
 - Gas storage in nanostructures
- ***Nanostructural materials Analysis***
 - Optical adsorption spectrometry with Perkin-Elmer 900UV/vis/NIR and Varian Cary spectrophotometer to determine optical transmission of transparent carbon nanotube film for touch screen and flat panel application
 - Resonance Raman scattering of carbon nanotube materials to determine chirality and quality using HORIBA T64000 micro-Raman Spectrometer and Renishaw inVia micro-Raman
 - Phonon confinement phenomena in nanowires using HORIBA T64000 micro-Raman Spectrometer and Renishaw inVia micro-Raman.
 - Pore size distribution and porosity (surface area and pore volume) analysis of carbon nanotubes and carbide derived carbons with Micromeritics ASAP 2020.
 - Impurities and crystalline quality of semiconducting naowires with HORIBA T64000 micro-Raman Spectrometer and Renishaw inVia micro-Raman

- Structural and morphological analysis of nanostructures with scanning electron microscope (SEM), energy dispersive x-ray spectroscopy (EDS), transmission electron microscope (TEM) and atomic force microscope (AFM)
- Thermogravimetric analysis of carbon nanotubes with Perkin-Elmer Pyris 1 and 7, and TA Instrument Q5000 to determine residual metal content and combustion temperature of components in CNT soot
- Analysis with Perkin-Elmer DMA 7e to determine flexural properties and coefficient of thermal expansion of CNT-metal matrix composites
- Design and build differential volumetric apparatus for measuring the Hydrogen-uptake in small samples
- Instron mechanical tester to determine tensile strength, elastic modulus and elongation of CNT-metal matrix composites
- IR and UV Raman spectroscopy of nanostructures
- Diffusivity, specific heat capacity and thermal conductivity analysis of CNT-metal matrix composite with Netzsch Nanoflash LFA 447
- Hydrogen uptake in carbon nanostructures with Hidden Isochema Intelligent gravimetric analyzer and differential volumetric analyzer
- Dark-field optical microscopy to determine carbon nanotube film quality
- Photoluminescence of nanowires with JY-Spex HR 460 spectrometer
- Design temperature dependent thermoelectric power measurement system to probe thermoelectric properties of films of carbon nanostructures and hybrid nanostructures
- Design temperature dependent electrical characterization system to interrogate CNT thin films and CNT-metal matrix composites
- High vacuum and ultra high vacuum system
- Manufacturer trained in the use of HORIBA T64000 micro-Raman Spectrometer and Renishaw inVia micro-Raman, Perkin-Elmer 900UV/vis/NIR, Micromeritics ASAP 2020, Perkin-Elmer thermogravimetric Analyzer, Perkin-Elmer Dynamic mechanical analyzer, TA Instrument thermogravimetric analyzer, Hidden Isochema Intelligent gravimetric analyzer and Netzsch Nanoflash LFA 447

EDUCATION

Pennsylvania State University, University Park, PA (May 2004)

Ph.D., Physics, Department of Physics

Thesis Title: Synthesis and Raman Scattering Studies of Novel Semiconductor nanostructures: Si and Ge and GaAs Twinning Superlattice Nanowires.

Thesis Advisor: Professor Peter C. Eklund

University of Kentucky, Lexington, KY (1996-1999)

Ph.D. program, Physics, Department of Physics & Astronomy

University of Cape Coast, Cape Coast, Ghana (December 1994)

B.Sc., Physics,

Thesis Title: Effect of ionization of impurity centers by electric field on the conductivity of superlattice. 1994

Thesis Advisor: Professor Samuel Y. Mensah

University of Cape Coast, Cape Coast, Ghana (December 1994)

Dip. Ed.

Konongo Odumasi Secondary School, Odumasi, Ghana

West Africa Examination council Certificate

EMPLOYMENT HISTORY

Penn State Altoona, Altoona, PA (August 2010-present)

Assistant Professor of Physics

Research Interests:

Utilizing nano-engineering techniques to manipulate nanoscale properties of one dimensional filamentous structures for application in green energy delivery systems. In particular, developing

- Advanced hybrid CNT-metal composite for efficient electric energy delivery
- Nano-engineered structures for energy storage application
- Engineering phonon transport in nanostructures for thermoelectric power generation, and
- Nano-engineered semiconducting nanowires for photovoltaic application

Teaching:

Fall 2010, PHYS 211, General Physics, Mechanics: Fun with Physics class where I introduce students to how to express and explain most of our daily activities using physics concepts in Newton laws of motion, energy conservation laws (real life applications of Newtonian mechanics).

YTC America Inc., Camarillo, CA (February 2008-July 2010)

Senior Member Technical Staff

Responsibilities:

- Develop chemical processing and functionalization techniques to tune the properties of carbon nanotubes for applications in advanced CNT-metal matrix composites and transparent conducting films
- Use diverse instruments: electrical characterization equipment, Perkin-Elmer dynamic mechanical analyzer, Netzsch nanoflash LFA 447 and Instron mechanical tester to investigate the electrical (resistivity/conductivity), the thermophysical (coefficient of thermal expansion), the thermal (thermal conductivity and specific heat capacity) and the mechanical properties (tensile

strength, elongation and elastic modulus) of CNT-metal matrix composites, respectively

- Improve the optoelectronic performance of carbon nanotube transparent conducting films for touch screen and flat panel display applications
- Make recommendation, purchase and install equipments necessary for the CNT-SENS group projects. Provide maintenance and calibration of selected instruments and work with management to administer about \$300K budget within 5% of projections for equipment purchases
- Coordinate daily, weekly and yearly program objectives, achieving goals by leading a team of technicians responsible for assembly and operation, material synthesis, depositions, and test systems
- Monitor, analyze, and develop reports on program results and present program highlights at technical conferences and corporate executive meetings
- Communicate with the research director and company President on a monthly basis to ensure targets are aligned with parent company expectations and to resolve critical project issues

ITT Technology Institute, Oxnard, CA (August 2009-July 2010)

Adjunct Professor of Physics

- Course: Introductory Physics and General Education (Science)

Pennsylvania State University, University Park, PA (2007-2008)

1999-2008

Postdoctoral Scholar, Energy Institute and Material Research Institute

Supervisors: Professors Angela D. Lueking and Peter C. Eklund

Responsibilities included:

- Synthesis and characterization nanomaterials (carbon nanotubes, carbon nanofibers and carbide derived carbon)
- Hydrogen storage in carbon nanomaterials (carbon nanotubes, carbide derived carbons and nanofibers)
- Environmental and chemical sensors using nanomaterials
- Spectroscopic characterization (Raman and absorption spectroscopy) of nanomaterials
- Pore size distribution and porosity (surface area and pore volume) analysis of nanomaterials

Pennsylvania State University, University Park, PA (2004- 2007)

Provost's Distinguished Postdoctoral Scholar, Department of Physics

Supervisor: Professor Peter C. Eklund

Research projects included:

- Synthesis nanomaterials (carbon nanostructures and semiconducting nanowires)
- Hydrogen storage in carbon nanostructures
- Designing and building differential volumetric system for hydrogen uptake studies
- Transport (resistivity and thermoelectric power) and optical properties of carbon nanotubes and semiconducting nanowires
- Modeling confinement phenomena in nanowires
- Spectroscopic studies of carbon and semiconducting nanostructures
- Structural and morphological characterization of nanomaterials with AFM, HRTEM and SEM

Pennsylvania State University, University Park, PA (1999- 2004)

Graduate Research Assistant, Department of Physics

Supervisor: Professor Peter C. Eklund

- Developed, built and utilized chemical vapor deposition (CVD), pulsed laser vaporization (PLV), thermal batch process (TBP) and arc discharge synthesis systems to fabricate carbon nanostructures (carbon nanotubes, carbon nanofibers and carbide derived carbons) and semiconducting nanowires (elemental and binary group II-VII, III-VI and IV-IV semiconductor compounds: Si, Ge, SiC, ZnS, Si_xGe_{1-x} and GaAs) as well as GaAs twinning superlattice nanowires for different applications (e.g., hydrogen storage, gas and chemical sensors)
- Studied quantum phenomena (phonon confinement) and inhomogeneous laser heating processes in semiconducting nanostructures (e.g., Si nanowires of diameter $d \leq 25$ nm) with HORIBA T64000 micro-Raman Spectrometer and Renishaw inVia micro-Raman
- Probed electronic processes in semiconductor nanowires via transmission/absorption and photoluminescence spectroscopy with Perkin-Elmer Lambda 900 UV/vis/NIR spectrometer and JY-Spex HR 460 spectrometer, respectively
- Investigated electronic and optical properties of GaAs twinning superlattice, Silicon and Germanium nanowires and carbon nanotubes
- Studied transport properties (thermoelectric power and resistivity) of Single-Walled Carbon nanotubes (SWNTs) and its potential application in nanomolecular gas and chemical sensors
- Studied resonance enhanced Raman scattering in carbon nanotubes

- Characterized nanostructures High Resolution Electron Microscope (HRTEM), Scanning electron Microscope (SEM) and Atomic Force microscope (AFM) for structural and morphological information

University of Kentucky, Lexington, KY (1996- 1999)

Teaching Assistant, Department of Physics and Astronomy

Responsibilities:

I was a physics laboratory supervisor and a general physics laboratory instructor. As a supervisor, I was in charge of maintaining and making laboratory equipments ready for each laboratory session. I served on laboratory manual review board, where at the end of every semester we reviewed the laboratory manual and recommended specific changes for improvement.

Aburi Girls' Secondary School, Aburi, Ghana (1994-1996)

I was a Mathematics and Physics teacher.

Accra New Town Junior Secondary School, Accra, Ghana (1989-1990)

I was Mathematics and Physics.

AWARDS/HONORS

- Provost's Distinguished Postdoctoral Scholar, (2004-2007)
- North East Alliance Certificate of Excellence (2003)
- FALL 2002 MRS Poster Excellence Award.
- Excellence in Teaching Award (Student Learning Center, University of Kentucky)
- Deans Award, University of Cape Coast, Ghana.

AFFILIATIONS

- American Physical Society and Material Research Society

PEER REVIEW

- Proposal: ACS Petroleum Research Fund (2005-Present)
- Journals (2004-Present)

JOURNAL PUBLICATIONS

- **Kofi W. Adu**, Qixiu Li, Sharvil C. Desai, Anton N. Sidorov, Gamini U. Sumanasekera and Angela D. Lueking "Morphological, Structural, and Chemical Effects in Response of Novel Carbide Derived Carbon Sensor to NH₃, N₂O, and Air" *Langmuir* **25**, 582 (2009)

- X. M. Liu, H. E. Romero, H. R. Gutierrez, **K. Adu** and P. C. Eklund "Transparent Boron-Doped Carbon Nanotube Films" *Nano Lett.*, **8**, 2613 (2008)
- Qiujie Lu, **Kofi W. Adu**, Humberto Gutiérrez, Gugang Chen, Kok-Keong Lew, Pramod Nimmatoori, Xi Zhang, Elizabeth Dickey, Joan Redwing, Peter Eklund "Raman Scattering from Si_{1-x}Ge_x Alloy Nanowires" *J. Phys. Chem. C.* **112**, 3209 (2008)
- **K.W. Adu**, Q. Xiong, H.R. Gutierrez, G. Chen, and P.C. Eklund "Raman Scattering as a .Probe of Phonon Confinement and Surface Optical Modes in Semiconducting Nanowires" *Appl. Phys. A.* **85** 287 (2006)
- **K. W. Adu**, H. R. Gutierrez, P. C. Eklund "Raman-active Phonon Line Profiles in Semiconducting Nanowires" *Vibrational Spectroscopy.* **42**, 165 (2006)
- **K. W. Adu**, H. R. Gutierrez, U. J. Kim, P. C. Eklund "Inhomogeneous Laser Heating and Phonon Confinement in Silicon Nanowires. A micro-Raman Studies" *Phys. Rev. B.* **73**, 155333 (2006). *Virtual Journal of Nanoscale Science & Technology* **13(19)** (2006).
- **K. W. Adu**, H. R. Gutiérrez, U. J. Kim, G. U. Sumanasekera, P. C. Eklund "Confined Phonons in Si Nanowires" *Nano Letters*, **5(3)** 409-414 (2005)
- Kumhyo Byon, John E. Fischer, **Kofi W. Adu**, Peter C. Eklund "Silicon nanowires: doping dependent n- and p- channel FET behavior" *Mater. Res. Soc. Symp. Proc. Vol 832 F9.9* 2004
- Bhattacharya S, Banerjee D, **Adu KW**, Samui S, Bhattacharyya "Confinement in silicon nanowires: Optical properties" *Appl. Phys. Lett.* **85(11)**: 2008-2010 Sep. 13 2004
- G. Sumanasekera, B. K. Pradhan, H. Romero, **K. W. Adu** and P. Eklund", Giant Thermopower Effects from Molecular Physisorption of Carbon Nanotubes, *Phys. Rev. Lett.*" **89**, 166801 (2004)
- Xiong, Q., Gupta, R.; **Adu, K. W.**; Dickey, E. C.; Lian, G. D.; Tham, D.; Fischer J. E.; Eklund, P. C "Raman spectroscopy and structure of crystalline gallium phosphide nanowires. *J. Nanosc. & Nanotech.* **3** 335-339, 2003.
- Mahan, G. D.; Gupta, R.; Xiong, Q.; **Adu, C. K.**; Eklund P. C. " Optical phonons in polar semiconductor nanowires." *PRB* **68**, 073402/1-073402/4, 2003
- Gupta, R.; Xiong, Q.; **Adu, C. K.**; Kim, U. J.; Eklund, P. C "Laser-Induced Fano Resonance Scattering in Silicon Nanowires." *Nano Letters*, 2003.
- Sumanasekera G. U., Pradhan B. K., **Adu C. K. W.**, Romero H. E., Foley H. C., Eklund P. C. " Thermoelectric chemical sensor based on single walled carbon nanotubes." *Mol. Cryst. And Liq. Cryst. Sci. And Tech. A*, **387** 31-37, 2002
- Sumanasekera G. U., Pradhan B. K., Romero H. E., **Adu K. W.**, Eklund P. C. "Giant thermopower effects from molecular physisorption on carbon nanotubes." *Phys. Rev. Lett.* **89** (16) 166801 Oct. 14 2002.
- Pradhan BK, Sumanasekera G. U., **Adu K. W.**, Romero H. E., Williams K. A., Eklund P. C., "Experimental probes of the molecular hydrogen-carbon nanotube interaction." *Physica B- Condensed Matter*, **323** (1-4): 115-121 OCT 2002
- Barsotti R. J., Fischer J. E., Lee C. H. , Mahmood J., **Adu C. K. W.** , Eklund P. C. "Imaging, structural, and chemical analysis of silicon nanowires." *Appl. Phys. Lett.* **81** (15): 2866-2868 Oct. 7 2002

- Sumanasekera G. U., **Adu C. K. W.**, Pradhan B. K., Chen G., Romero H. E., Eklund P. C. "Thermoelectric study of hydrogen storage in carbon nanotubes." Phys. Rev. B. 65 (3): 035408 Jan. 15 2002
- **Adu C. K. W.**, G. U. Sumanasekera, Pradhan B. K., Romero H. E., Eklund P. C. "Carbon nanotubes: A thermoelectric nano-nose." Chem. Phys. Lett. 337 (1-3): 31-35 MAR 30 2001
- Sumanasekera G. U., **Adu C. K. W.**, Fang S., Eklund P. C. "Effects of gas adsorption and collisions on electrical transport in single-walled carbon nanotubes." Phys. Rev. Lett. 85 (5): 1096-1099 JUL 31 2000.
- Mensah S. Y, Allotey F. K. A., **Clement A.** "Effect of ionization of impurity centers by electric field on the conductivity of superlattice." Super lattices and Microst. 19 (2): 151-158 1996

PROCEEDING PUBLICATIONS

- **Adu C. K. W.**, Loper A. L., Pradhan B. K., Chen G., Bhattacharyya S., Eklund P. C., Fischer J. E., Friedman A. D., Holloway B. C. Smith M. W., "Production of single walled carbon nanotubes using tunable radiation from a free electron laser (FEL)." Carbon'01, Int. Conf. on Carbon. Lex. KY, July 14-19, 292-293 2001.
- G. U. Sumanasekera, **C. K. W. Adu**, B. K. Pradhan, and P. C. Eklund "Thermoelectric Study of Hydrogen Storage in Carbon Nanotubes." Making Functional Materials with Nanotubes, MRS Symposium Proc. Series v. 706. (2001)
- G. U. Sumanasekera, B. K. Pradhan, **C. K. W. Adu**, H. E. Romero and P. C. Eklund, "Single Walled Carbon Nanotubes (SWNTs) as a Gas Sensor." Mat. Res. Soc., Symp. Proc., 633, A14.20.1 (2000)

BOOKS/BOOK CONTRIBUTIONS

- K. W. Adu, H. R. Gutiérrez and Peter C. Eklund, "Phonon in Silicon Nanowires" in Nanosilicon, Ed. Vijar Kumar, Elsevier, Amsterdam 2007.

CONFERENCE PRESENTATIONS/INVITED TALKS

- Qijie Lu , **Kofi Adu** , Xi Zhang , Kok-Keong Lew , Pramod Nimmatoori , Elizabeth Dickey , Joan Redwing , Peter Eklund "Raman Scattering from Si1-xGex Alloy Nanowires" March 2007 APS Meeting, W31 9, Colorado

- XiaoMing Liu , Hugo Romero , Humberto Gutierrez , **Kofi Adu** , Peter Eklund “ Optical transmittance and sheet resistance of boron-doped single walled carbon nanotubes” March 2007 APS Meeting, W31 2, Colorado
- **Kofi Adu** , Gugang Chen , Humberto Gutierrez , Peter Eklund “Optical Adsorption in small diameter Si nanowires” March 2007 APS Meeting, N44 9, Colorado
- **K. W. Adu**, Peter C. Eklund, H. R. Gutiérrez “Micro-Raman Study of Phonon Confinement Effects in Si Nanowires” 32nd International Conference of the Federation of Analytical Chemistry and Spectroscopy Societies (FACSS) and 51st International Conference on Analytical Sciences and Spectroscopy (ICASS) Oct. 9-14, 2005 Quebec, Canada.
- Peter C. Eklund, **K. W. Adu**, H. R. Gutiérrez “Micro-Raman Scattering Investigation of Phonon Confinement Effects in Si Nanowires” 3rd International Conference on Advance Vibrational Spectroscopy ICVAS-3, Aug.14-19, 2005, Wisconsin, USA
- Peter C. Eklund, **K. W. Adu**, H. R. Gutiérrez “Micro-Raman Scattering Investigation of phonon confinement effects in Si Nanowires” 12th Brazillian Workshop on Semiconductor Physics (BWSP) Sao Jose dos Campos, SP Brazil. April 4-8, 2005
- **K. W. Adu**, H. R. Gutiérrez, P. C. Eklund “ Absorption and Photoluminescence in very small diameter Si nanowires” March 2005 APS Meeting, L17 2, Los Angeles
- P. C. Eklund, **K. W. Adu**, H. R. Gutiérrez, Un J. Kim “Interplay of phonon confinement and thermal phenomena on the 520 cm⁻¹ Raman band in very small diameter Silicon nanowires” March 2005 APS Meeting, L17 3, Los Angeles
- P. C. Eklund, **K. W. Adu**, H. R. Gutiérrez, Un J. Kim “Selective Fractionation of nanowire diameter by Centrifugation” March 2005 APS Meeting, V25 5, Los Angeles
- **K. W. Adu**, U. J. Kim, H. R. Gutierrez and P. C. Eklund. “Phonon confinement phenomenon in the first order Raman spectrum in Ge and Si nanowires.” March 2004 APS meeting, B36 12
- **K. W. Adu**, U. J. Kim, H. R. Gutierrez and P. C. Eklund. “*In situ* oxidation of Si nanowires as a means of preparing smaller diameter Nanowires.” March 2004 APS meeting, B16 7
- H. R. Gutierrez, **K. W. Adu**, U. J. Kim and P. C. Eklund. “Periodic quantum dots in a Nanowire.” March 2004 APS meeting, N 32 10
- K. Byon, J. E Fischer, C. Taii, A. T. Johnson, **C. K. W. Adu** and P. C. Eklund. “Electrical Properties of Si nanowires for nanoscale device application.” March 2004 APS meeting, B16 2
- **K. W. Adu**, Rajeev Gupta, U. J. Kim, Qihua Xiong, John Zengel and Peter C. Eklund “Phonon Confinement in Elemental Semiconductor Nanowires – Is it Real?” Dec. 2003 MRS Meeting. N7.9
- **K. W. Adu**, U. J. Kim, B. K. Pradhan, D. Tham, D Yates, J. E. Fischer, U. D. Venkateswaran and P. C. Eklund “ Observation of quasi-Periodic Twinning Superlattice in GaAs Nanowires.” Dec. 2003 MRS Meeting. N8.2,T6.2,Z6.2

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- John Zengel, R. Gupta, **K. W. Adu**, C. P. Beetz and Peter C. Eklund "Gallium Nitride Nanowires as optoelectronic Devices." Dec. 2003 MRS Meeting. Y4.3
 - **C. K. W. Adu**, R. Gupta Q. H. Xiong, U-J. Kim, Bhabendra K. Pradhan, G. D. Mahan and Peter C. Eklund "Experimental Study of Raman scattering mechanism in semiconductor nanowires.", March 2002 APS meeting, F24.003.
 - G. U. Sumanasekera, S Bhattacharyya, **C. K. W. Adu**, Bhabendra K. Pradhan, C. H. Lee,, R Russo, E Luzzi, J. E. Fischer and Peter C. Eklund "Quantum confinement Of phonons in silicon nanowires.", March 2002 APS meeting, P33.171.
 - G. U. Sumanasekera, **C. K. W. Adu**, Bhabendra K. Pradhan, H. E. Romero and Peter C. Eklund "Carbon nanotubes as chemical sensors: Six membered ring molecules", March 2002 APS meeting, W24.008.
 - Bhabendra K. Pradhan, **C. K. W. Adu**, G. Chen, J. Kim, D Yettes, J. E. Fischer and Peter C. Eklund "Thermal Production of Gallium Arsenide nanowires." March 2002 APS meeting, W24.005.
 - Bhabendra K. Pradhan, **C. K. W. Adu**, Q. H. Xiong, U-J. Kim, Bhabendra K. Pradhan and Peter C. Eklund "Raman Scattering from GeSi alloy nanowires." March 2002 APS meeting, P33.156.
 - **C. K. W. Adu**, Q. Xiong, S. Bhattacharyya, G. Chen, A. D. Friedman, B. C. Holloway, M. W. Smith, J. E. Fischer and Peter C. Eklund "High production rate synthesis of single Walled Carbon Nanotubes (SWNTs) Using Free Electron Laser." March 2002 APS meeting, B25.011.
 - **C.K.W. Adu**, A.L. Loper, G. Chen, B. K. Pradhan, P.C. Eklund, A. D. Friedman, B. C. Holloway and M. W. Smith "Production of Single Walled Carbon Nanotubes using tunable radiation from a Free Electron Laser (FEL).", CARBON 2001 Conference, July 14th 2001, 14.3.
 - **Clement K. W. Adu**, G. U. Sumanasekera, H. Romero, Bhabendra K. Pradhan, and Peter C. Eklund "Carbon Nanotubes as a Thermoelectric Nano-Nose.", March 2001 APS meeting, W20.007.
 - G. U. Sumanasekera, **Clement K. W. Adu**, Bhabendra K. Pradhan, H. E. Romero and Peter C. Eklund, "Thermoelectric study of Hydrogen storage in carbon nanotubes." MRS Fall 2001, Z10.4.
 - G. U. Sumanasekera, Bhabendra K. Pradhan, **Clement K. W. Adu**, H. E. Romero and Peter C. Eklund, "Single wall carbon nanotubes: A chemical sensor." MRS Fall 2001, Z9.30.
 - H. E. Romero, G. U. Sumanasekera, **Clement K. W. Adu**, Bhabendra K. Pradhan and Peter C. Eklund, "Intrinsic thermoelectric power of carbon nanotubes." MRS Fall 2001, Z9.27.
 - Bhabendra K. Pradhan, Gamini U. Sumanasekera, **Clement K. W. Adu**, Hugo E. Romero, Keith A. Williams, and Peter C. Eklund "Experimental Probes of the Molecular Hydrogen-Carbon Nanotube Interaction." CNT10, 2001.

- Peter C. Eklund, Gamini S. Sumansekera, **Clement, K. W. Adu**, and Bhabendra K. Pradhan, Nanoscience "Carbon Nanotubes: a Thermoelectric gas Sensor." The National academy of Sciences, Washington, DC, 2001.
- Gamini U. Sumansekera, **Clement K. W. Adu**, Bhabendra K. Pradhan, Milton W. Cole and Peter C. Eklund "Thermoelectric Study of Hydrogen Storage in Carbon Nanotubes." March 2001 APS meeting, Z20.007.
- Peter C. Eklund, Gamini S. Sumansekera, **Clement, K. W. Adu**, and Bhabendra K. Pradhan, "Carbon Nanotubes: a Thermoelectric Chemical Sensor." ACS San Diego National Meeting, 2001.