



ASHISH KIRANBHAI PANCHAL

Contact

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Qualifications

Ph.D. 2010, IIT Bombay
M.Tech. (Energy Systems Engineering) 2003, IIT Bombay
B.E. (Electrical) 1996, SVRCET, Surat

Area of interest

Renewable energy technologies, Silicon based solar cells technology, micro and nano materials characterization techniques, advanced electrical power systems

Teaching experience

- Lecturer (Ad hoc) in Electrical Engineering Department, SVRCET, September-1996 to June-1997
- Lecturer in Electrical Engineering Department, SCET, June-1997 to December-1997
- Lecturer in Electrical Engineering Department, SVNIT, January-1998 to January-2006
- Assistant Professor in Electrical Engineering Department, SVNIT, January-2006 to till date

Subjects taught

Electrical Technology, Electrical Networks, Electrical Power Systems, Flexible AC Transmission, Switch Gear and Protecting Devices, Solar Photovoltaic Fundamentals and Technologies

Ph.D. thesis

Title: "Silicon quantum dots embedded in silicon nitride dielectric multilayer prepared using hot-wire chemical deposition technique for solar cell application"

Abstract: Silicon based solar cell technology has low efficiency due to its inability to cover whole solar spectrum of visible light. When Silicon size is reduced in the nano-regime (< 10 nm), its band gap energy increases. These Silicon structures are known as Silicon quantum dots. This property is helpful for increasing the light absorption as well as to improve electrical charge transportation. This research work targets to increase the Si solar cell efficiency in the area of all silicon tandem solar cell projects for third generation solar cell technology. In this work, Silicon quantum dots embedded in silicon nitride dielectric multilayer films are prepared using hot-wire chemical vapor deposition technique at IIT Bombay. All the films are analyzed by structural, chemical and electrical characterizations techniques. Finally, this multilayer film is included in a p-i-n solar cell device as an absorber layer (middle i-layer). These devices have exhibited excellent light absorption in the short wavelength range. This work is supervised by Prof. C.S. Solanki at IIT Bombay and is funded by Applied Materials, USA.

Achievements

- Gold medal for securing highest marks in Electrical Power Systems Subjects at BE IV (Electrical) examination conducted by South Gujarat University, Surat.
- QIP scholarship during M.Tech. Studies at IIT Bombay for 18 months.
- Best paper presentation award at 18th International Photovoltaic Solar Energy Conference-2009 (PVSEC-2009) held by JadHAVpur University, Kolkata.
- Award for Excellence in Ph.D. thesis work at 48th Convocation of IIT Bombay on 6th August 2010

Seminar/lectures delivered

- MIT, Cambridge, USA
- Purdue University, Indiana, USA
- Hawaii Convention center, Hawaii, USA
- SCET, Surat
- IIT Bombay, Mumbai
- Visited Imperial College, London, UK
- Visited Applied Materials (AMAT), San Jose, California, USA
- XRD experiments done at UIUC, Illinois, USA

Reviewed

- Book Chapters "Non Conventional Energy Sources" publisher Pearson Education, India, 2010
- Paper for the Journal of Nano Particle Research

PG Student's supervision

- 1 Ph.D.
- 4 M.Tech.

Papers published in international journals

- **A.K.Panchal**, C.S.Solanki, “Post deposition annealing temperature effect on silicon quantum dots embedded in silicon nitride dielectric multilayer prepared by hot-wire chemical vapor deposition”, Thin Solid Films 517(12) (2009) 3488-3491. **(This paper has been cited by two publications in international Journals Thin Solid Films and Physica Status Solidi E.)**
- **A.K.Panchal**, C.S.Solanki, “Fabrication of silicon quantum dots in SiN_x multilayer using hot-wire CVD”, Journal of Crystal Growth 311(9) (2009) 2659-2663.
- **A.K.Panchal**, D.K.Rai, M.Mathew, C.S.Solanki, “Silicon quantum dots in silicon nitride dielectric- A review”, Nano Brief Reports and Reviews 4(5) (2009) 265-279.
- **A.K.Panchal**, D. K. Rai, C.S.Solanki, “Annealing effects of capacitance-voltage characteristics of a-Si/SiN_x multilayer prepared using hot-wire chemical vapour deposition”, in print for Journal of Nano Science and Nanotechnology.
- **A.K.Panchal**, D.K.Rai, M.Mathew, C.S.Solanki, “Photovoltaic devices with silicon quantum wells and dots structures in silicon nitride dielectric” under review for Nano Brief Reports and Reviews
- **A.K.Panchal**, D.K.Rai, M.Mathew, C.S.Solanki, “a-Si/SiN_x multilayered light absorber for solar cell”, under review for Journal of Nano Particle Research.

Papers in international conferences

- **A.K.Panchal**, “Voltage stability of a large grid” paper presented at the 7th International Power Engineering Conference (IPEC-2005) held at Singapore, December 2005.
- **A.K.Panchal**, C.S.Solanki, S.N.Ghosh, “Energy analysis of thin film crystalline silicon solar cell technologies” poster presented at European Materials Research Society (EMRS) 2007 Symposia held at Strasbourg, France, May-June 2007.
- Antisen A.M., **A.K.Panchal**, C.S.Solanki, “Precipitation of Si nanocrystals in Si-rich Silicon nitride layers deposited using HWCVD” paper presented at 5th International Conference on Hot-Wire Chemical Vapor Deposition (HWCVD5) held at MIT USA, August-2008.
- **A.K.Panchal**, C.S.Solanki, “Post deposition annealing temperature effect on silicon quantum dots embedded in silicon nitride dielectric multilayer prepared by hot-wire chemical vapor deposition”, paper presented at 5th International Conference on Hot-Wire Chemical Vapor Deposition (HWCVD5) held at MIT USA, August-2008.
- **A.K.Panchal**, D.K.Rai, C.S.Solanki, “Electrical characterization of Si-QD/SiN_x multilayer prepared using HWCVD” paper presented at PVSEC18 International Conference Kolkata, January-2009. **This paper won the best poster presentation award.**
- **A.K.Panchal**, D.K.Rai, M.Mathew, C.S.Solanki, “Effects of substrate temperature and SiH₄ cracking time on a-Si/SiN_x multilayer prepared using HWCVD” paper presented at International Workshop on Physics of Semiconductor Devices (IWPSD-2009) at Jamia Melia Islamia, New Delhi, December-2009.
- **A.K.Panchal**, D.K.Rai, M.Mathew, C.S.Solanki, “Co-relation between capacitance-voltage, conductance-voltage and photoconductive properties of as-deposited and annealed a-Si/SiN_x multilayer films prepared using hot-wire CVD”, paper presented at the 35th IEEE Photovoltaic Specialists Conference (PVSC) at Hawaii, USA, June-2010.