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Education

D. Eng. (Electrical), Osaka University, Japan, 1974
M. Eng. (Electrical), Osaka University, Japan, 1971
B. Eng. (Electrical), Osaka University, Japan, 1969

Research Interest

Molecular Beam Epitaxy for quantum devices and nanoelectronics & nanophotonics as well as for the development of high performance nanostructure solar cells

Honors

1979	NRCT Award on “Schottky Barrier Solar Cells”
1981	NRCT Award on “Solar Cell Technology”
1982	NRCT Award on “Solar Cell Panels”
1986	The Outstanding Researcher of the Year by National Research Council of Thailand (NRCT) in the Area of Engineering and Industrial Research
1991	NRCT Award on “a-Si Solar Cells”
1991	CU Scientific Invention Award on “Holographic ID”
1993	CU Scientific Invention Award on “Multiple Exposure Holograms”
1995-1998	The Senior Researcher Fellowship by the National Science and Technology Development Agency (NSTDA)
1996	Science and Technology Award by Thailand Toray Science Foundation
1997	The Outstanding Researcher of the year 1997 by Ministry of University Affairs.
1997	The Outstanding Engineer of the year 1997 by Engineering Alumni Association, Chulalongkorn University
2000	The Outstanding Engineer of the year 2000 by Energy Conservation Association of

	Thailand
2004	Senior Research Scholar 2004 by Thailand Research Fund
2004	PVSEC-Award on the Contribution to “Solar Cell Research”
2004	Best Poster Award on “Ordered QDs” from MNE04
2004	Best Paper Award on “QDMs for Quantum Computing” from EECON-27
2007	Model Professor Award in S&T by CU Professor Council
2007	Outstanding Researcher in Science and Technology by Thailand Toray Science Foundation
2008	Highly honored receiving prestigious “Dussadeemala” medal from his Majesty the King on his life-long research contribution

Invitations and Guest Professorships

1982-2000	The Member of Committee on Physical Science and Mathmetics, National Research Council of Thailand
1989	The Member of International Advisory Committee of Solar World Congress'89, International Solar Eergy Society (ISES)
1990-1991, 1993-1994, 1996, 1999, 2001, 2005	The Member of International Advisory Committee of the 4th, 5th, 6th, 7th, 9th, 11th,12th and 15th International Photovoltaic Science and Engineering Conferences (PVSEC-4, -5, -6, -7, -9, -11, -12 and -15)
2004	The General Chairman of International Advisory Committee of the 14th International Photovoltaic Science and Engineering Conference (PVSEC-14)
2000, 2002, 2005	The International Committee Member of the 28th, 29th and 31st IEEE Photovoltaic Specialists Conferences

He has written 5 books and 377 publications (journals, conference papers and technical reports) on solar cells, photovoltaic applications, laser engineering, optoelectronics and nanoelectronics.

Abstract

Novel Nanoelectronic and Nanophotonic Devices*

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High performance solar cells have been developed using quantum nanostructures grown by molecular beam epitaxy (MBE). Thin-capping-and-regrowth of quantum dots (QDs) is key process to create novel quantum dot molecules (QDMs) which are laterally close packed nanostructures. InAs multi-stack quantum dot molecules are inserted in the GaAs/GaAlAs hetero-structure solar cells. This nanostructure solar cell gives broad spectral response at longer wavelength beyond the band-edge of GaAs. It is found that III-V compound semiconductors with nanostructures integration based solar cells are stable even being operated at high concentration sunlight. However, the low open circuit voltage is remained to be improved for higher efficiency of this new type quantum dot solar cell.

III-V compound semiconductors are used in most photonic devices, e.g. light emitting diodes (LEDs), laser diodes (LDs) as well as photo-detectors. High speed and energy efficient photonic and electronic devices could be realized by integration of active quantum dots into the respective structures, such as quantum dot lasers having the best record of lowest threshold current density, quantum dot transistors operating at very high frequency. Quantum dots could be active layers in infrared detectors for night vision, military and earth resource applications.

Various quantum nanostructures, such as aligned quantum dots, cross hatched quantum dots, quantum rings, bi-quantum dots (×2), quadra quantum dots (×4), quantum dot rings with octa quantum dots (×8) have been developed by several MBE growth techniques, i.e. droplet epitaxy, quantum ring templates. Some of these quantum nanostructures have potential to be quantum bits for future computation based on spintronics and cellular automata. Electron spins could represent binary digital system which works with reliable data. Data transmission by Coulomb repulsion of electrons with negative charge could be conducted at very high speed and at low power consumption in quantum cellular automata using quadra quantum dots in a line. Inverters, logic gates, memories could be designed using aligned and cross hatched quadra quantum dots. In addition, octa quantum dots give 3 logic values of “1”, “0” and “±1/2” for more intelligent computation like human brain.

Novel nanoelectronic and nanophotonic devices are key inventions for our future green and intelligent society.

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