

รายการอ้างอิง

- [1] Fedor mitschke, Fiber Optics Physics and technology, (2009)
- [2] Zaitsev, S.V., et el. Time-resolved photoluminescence and carrier dynamics in vertically-coupled self-assembled Quantum Dots epitaxy (MBE). Japanese Journal of Applied Physics 38, (1999): 601.
- [3] Kroemer, H. "Semiconductor light-emitting diode and method for producing same" US Patent 3958265, May 18, (1976).
- [4] Rinaldi, F. Basics of Molecular Beam Epitaxy (MBE). Annual Report (2002).
 - ‘ Optoelectronics Department. University of Ulm. Germany, 2002.
- [5] <http://www.phys.ksu.edu/personal/mnakarmi/MOCVD/mocvd.html>
- [6] John DiNardo, N. Nanoscale Characterization of Surfaces and Interfaces, 1994.
- [7] Yao, N., and Wang, Z. Handbook of Microscopy for Nanotechnology, 2005.
- [8] Hannink, R.H.J., and Hill, A.J. Nanostructure control of materials, 2006.
- [9] Shimizu, H., Saravanan, S., Yoshida, Y., Ibe, S., and Yokouchi, N. InAs quantum dot lasers with extremely low threshold current density ($7 \text{ A/cm}^2/\text{Layer}$). Journal of Applied Physics 44 (2005) : L1103-L1104.
- [10] Chang, F.Y., Lee, J.D., and Lin, H.H. Low threshold current density $1.3 \mu\text{m}$ InAs/InGaAs quantum dot lasers with InGaP cladding layers grown by gas-source molecular-beam epitaxy. Electronics Letters Vol. 40 (2004) : 179-180
- [11] Kamins, T.I., and Stanley, R.W. Lithographic positioning of self-assembled Ge islands on Si (001). Applied Physics Letter 71(1997) : 1201-1203.
- [12] Ritz, M., Kaneko, T., and Eberl, K. The effect of surface reconstructions on the surface morphology during in situ etching of GaAs. Applied Physics Letter 71(1997) : 695-697
- [13] Placidi, E., Arciprete, F., Fanfoni, M., Patella, F., and Balzarotti, A. The InAs/GaAs (001) Quantum Dots Transition : Advances on Understanding, Lecture Notes in Nanoscale Science and Technology, Self-Assembled Quantum Dots (2007) : 1-23

- [14] Uccelli, E., Bauer, J., Bichler, M., Schuh, D., Finley, J. J., Abstreiter, G., and Fontcuberta i Morral, A. Self-assembly of InAs Quantum Dot Structures on Cleaved Facets. Lecture Notes in Nanoscale Science and Technology, Self-Assembled Quantum Dots (2007) : 24-41
- [15] Pohl, U.W. InAs/GaAs Quantum Dots with Multimodal Size Distribution. Lecture Notes in Nanoscale Science and Technology, Self-Assembled Quantum Dots, (2007) : 43-66
- [16] Eaglesham, D.J., and Cerullo, M. Dislocation-free Stranski-Krastanow growth of Ge on Si(100). Physics Review Letter 64 (1990) : 1943-1946.
- [17] Flack, F., Samarth, N., Nikitin, V., Crowell, P. A., Shi, J., Levy, J., and Awschalom, D.D. Near-field optical spectroscopy of localized excitons in strained CdSe quantum dots. Physics Review B 54 (1996) : R17312-R17315.
- [18] Xin, S.H., Wang, P.D., Yin, A., Kim, C., Dobrowolska, M., Merz, J.L., and Furdyna, J.K. Formation of self-assembling CdSe quantum dots on ZnSe by molecular beam epitaxy. Applied Physics Letter 69 (1996) : 3884-3886.
- [19] Kitamura, K., Umeya, H., Jia, A., Shimotomai, M., Kato, Y., Kobayashi, M., Yoshikawa, A., and Takahashi, K. Self-assembled CdS quantum-dot structures grown on ZnSe and ZnSSe, Journal of Crystal Growth 214 (2000) : 680-683.
- [20] Pinczelits, M., Springholz, G., and Bauer, G. Direct formation of self-assembled quantum dots under tensile strain by heteroepitaxy of PbSe on PbTe(III). Applied Physics Letter 73 (1998) : 250-252.
- [21] Bressler-Hill, V., Varma, S., Lorke, A., Nosh, B.Z., Petroff, P.M., and Weinberg, W.H. Island scaling in strained heteroepitaxy: InAs/GaAs (001). Physics Review Letter. 74 (1995) : 3209-3212.
- [22] Qianghua, X., Madhukar, A., Chen, P., and Kobayashi, N.P. Vertically self-organized InAs quantum box islands on GaAs (100). Physics Review Letter 75 (1995): 2542-2545.

- [23] Leon, R., Fafard, S., Leonard, D., Merz, J.L., and Petroff, P.M. Visible luminescence from semiconductor quantum dots in large ensembles. Applied Physics Letter 67 (1995) :521-523.
- [24] Ramvall, P., Tanaka, S., Nomura, S., Riblet, P., and Aoyagi, Y. Confinement induced decrease of the exciton-longitudinal optical phonon coupling in GaN quantum dots. Applied Physics Letter 75 (1999) :1935-1937.
- [25] Damilano, B., Grandjean, N., Semond, F., Massies, J., and Leroux, M., From visible to white light emission by GaN quantum dots on Si(III) substrate. Applied Physics Letter 75 (1999) 962-964.
- [26] Tachibana, K., Someya, T., Ishida, S., and Arakawa, Y. Selective growth of InGaN quantum dot structures and their microphotoluminescence at room temperature. Applied Physics Letter 76 (2000) : 3212-3214.
- [27] Zundel, M.K., Specht, A.P., Eberl, K., Jin-Phillip, N.Y., and Philipp, F. Structural and optical properties of vertically aligned InP quantum dots. Applied Physics Letter 71 (1997): 2972-2974.
- [28] Hatami, F., et al. Radiative recombination in type-II GaSb/GaAs quantum dots, Applied Physics Letter 67 (1995): 656-658.
- [29] Wang, Z. M., Holmes, K., Mazur, Yu.I., and Salamo, G.J. Fabrication of (In,Ga)As quantum-dot chains on GaAs(100). Applied Physics Letter 84 (15 MARCH 2004) : 1931-1933.
- [30] Mano, T., Kuroda, T., Mitsuishi, K., Yamagiwa, M., Guo, X.J., Furaya, K., Sakada, K., and Koguchi, N. Ring-shaped GaAs quantum dot laser grown by droplet epitaxy : Effects of post-growth annealing on structural and optical properties. Journal of Crystal Growth 301 (2007) : 740-743.
- [31] Thet, C.C., Kanjanachuchai, S., and Panyakaew, S. Growth of InAs quantum-dot hatches on InGaAs/GaAs cross-hatch virtual substrates. Microelectronic Engineering 84 (2007) : 1562-1565

- [32] Zhang, C. L., Xu, B., Wang, Z. G., Jin, P., and Zhao, F.A. Development of cross-hatch grid morphology and its effect on ordering growth of quantum dots. Physica E 25 (2004) : 592-596.
- [33] Thet, C.C. Growth and Characterisation of Ordered InAs Quantum Dots on Cross-hatch Virtual Substrate. Ph.D.'s thesis, Department of Electrical Engineering Faculty of Engineering Chulalongkorn University, 2006.
- [34] Limwongse, T. Evolution Of InAs Quantum Dots Grown On Cross-hatch Substates. Master Degree's thesis, Department of Electrical Engineering Faculty of Engineering Chulalongkorn University, 2006.
- [35] Vdovin, V.L. Natute and origin of pure edge dislocations in low mismatched epitaxial structure, Journal of Crystal Growth 172 (1997) : 58-63.
- [36] Hongland, R.G., Hirth, J.P., Misra, A., and Martin. D. Influence of surface step on glide of threading dislocations during layer growth. Applied Physics Letter 84 (2004) : 5136-5138.
- [37] Zeghbrouck, B.V. Principles of Semiconductor Devices. Colarado University, 2006.
- [38] Grundmann, M. The Physics of semiconductors. Springer, 2006.
- [39] Reed, M. A., Randall, J.N., Aggarwal, R.J., Matyi, R.J., Moore, T.M., and Wetsel, A.E. Observation of discrete electronic states in a zero-dimensional semiconductor nanostructure. Physics Review Letter 60(1987): 535–537
- [40] Suraprapapich, S., Kanjanachuchai, S., Thainoi, S., and Panyakeow, S. Ordered quantum dots formation on engineered template by molecular beam epitaxy. Microelectronic Engineering 78-79 (2005) : 349-352
- [41] Herman, M. A., and Sitter, H. Molecular Beam Epitaxy Fundamental and Current Status. Springer-Verlag, Berlin, 1989.
- [42] Sears, K., Mokkapati, S., Tan, H.H., and Jagadish, C. In(Ga)As/GaAs Quantum Dots Grown by MOCVD for Opto-electronic Device Applications. Lecture Notes in Nanoscale Science and Technology, Self-Assembled Quantum Dots, (2007) : 359-404

- [43] Bansal, B. Gokhale, M.R., Bhattacharya, A., and Arora, B.M. Growth kinetics effects on self-assembled InAs/InP quantum dots. Applied Physics Letter 87 (2005) : 203104 - 203104
- [44] Yamaguchi, K., Saito, Y., and Ohtsubo, R., Size-shrinkage effect of InAs quantum dots during a GaAs capping growth. Applied Surface Science 190 (2002) : 212-217
- [45] Songmuang, R., Kiravittaya, S., and Schmidt, O.G. Shape evolution of InAs quantum dots during overgrowth. Journal of Crystal Growth 249 (2003) : 416-421
- [46] Kastner, M.A. The single electron transistor and artificial atoms, Annual Physics (Leipzig) 9 (2000) : 885 – 894.
- [47] Snider, G., and et al. Quantum-dot cellular automata. Papers of microprocesses and nanotechnology conference, Yokohama, Japan (1999) : 90–91.
- [48] Kiravittaya, S., Heidemeyer, H., and Schmidt, O.G. In(Ga)As Quantum Dot Crystals on Patterned GaAs(001) Substrates. Lateral Aligment of Epitaxial Quantum Dots (2007) : 489-511
- [49] Qian, X. Li, J. Wasserman, D. Goodhue, W. D., Uniform InGaAs quantum dot arrays fabricated using nanosphere lithography. Applied Physics Letter 93, (2008) : 231907
- [50] Wang, Z.M., and Salamo, G.J. Towards Quantum Dot Crystals Via Multilayer Stacking on Different Indexed Surfaces, Lateral Alignment of Epitaxy Quantum Dots (2007) : 325-345.
- [51] Wang, Z.M., Holmes, K., Mazur, Yu.I., and Salamo, G.J., Fabrication of .In,Ga.As quantum-dot chains on GaAs(100), Applied Physics Letter 84 (2004) : 1931-1933
- [52] Bhattacharya, P., and et al. Properties of Lattice matched and Strained Indium Gallium Arsenide. INSPEC, London, 1993.
- [53] Chang, K.H., Gibala, R., and Srolovitz, D.J. Crosshatched surface morphology in strained III – V semiconductor films, Japanese Journal of Applied Physics 69 (2005) : 4093-4098.

- [54] Tamura, M., Hashimoto, A., and Nakatsugawa, Y. Threading dislocations in $\text{In}_x\text{Ga}_{1-x}$ As/GaAs heterostructure, Japanese Journal of Applied Physics, 72 (1992) : 3398-3405.
- [55] Romanov, A.E., Pompe, W., Mahtis, S., Beltz, G.E., and Speck, J.S. Threading Dislocation Reduction in Strained Layers. Journal of Applied Physics 85 (1999) : 182-192.
- [56] Andrews, A.M., Speck, J.S., Romanov, A.E., Bobeth, M., and Pompe, W. Modeling Crosshatch Surface Morphology in Growing Mismatched Layer. Journal of Applied Physics 91 (2002) : 1933-1943.
- [57] Andrews, A. M., Lesar, R., Kerner, M.A., and Speck, J.S. Modeling Crosshatch Surface Morphology in Growing Mismatched Layer Part II: Periodic boundary conditions and dislocation groups. Journal of Applied Physics 95 (2004) : 6032-6047.
- [58] Wu, J., Li, W., Fan, T.W., and Wang, Z.G. Breaking up of misfit dislocations in GaAs/In_{0.3}Ga_{0.7}As/GaAs heterostructure, Applied Physics Letter 67, (1995) : 846-847.
- [59] Wang, S.M., Thordson, J.V., Anderson, T.G., Jian, S., Yang, L.X., and Shen, S.C. Influence of cap layer thickness on optical quality in In_{0.2}Ga_{0.8}As/GaAs single quantum wells. Applied Physics Letter 65 (1994) : 336
- [60] Kim, K.M., Park, Y.J., Park, Y.M., and Hyon, C.K. Alignment of InAs quantum dots on a controllable strain-relaxed substrate using an InAs/GaAs superlattice. Journal of Applied Physics 92 (2002) : 5453-5456
- [61] Voigtländer, B. Formation of Two-Dimensional Si/Ge Nanostructures Observed by STM, Quantum Dots: Fundamentals, Applications, and Frontiers 190 (2005) : 43-54
- [62] http://en.wikipedia.org/wiki/Turbomolecular_pump
- [63] <http://www.mbe-komponenten.de/products/manipulation/sh-o.html>
- [64] <http://www.tectra.de/k-cell.htm>
- [65] http://en.wikipedia.org/wiki/Hot_filament_ionization_gauge
- [66] http://en.wikipedia.org/wiki/Reflection_high_energy_electron_diffraction

- [67] http://en.wikipedia.org/wiki/Quadrupole_mass_analyzer
- [68] <http://www.stev.gb.com/science/spectroscopy.html>
- [69] Thudsalingkarnsakul, N., Effective One-Dimensional Electronics Structure Of InGaAs Quantum Dot molecules. Master Degree's thesis, Department of Electrical Engineering Faculty of Engineering Chulalongkorn University, 2008.
- [70] http://commons.wikimedia.org/wiki/File:Atomic_force_microscope_block_diagram_v2.svg
- [71] Franchi, S., Trevisi, G., Seravalli, L., and Frigeri, P. Quantum dot nanostructures and molecular beam epitaxy. Progress in Crystal Growth and Characterization of Materials 47 (2003) : 166-195.
- [72] <http://comp.uark.edu/~jchakhal/REED.htm>
- [73] Franke, T., Kreutzer, P., Zacher, Th., Naumann, W., and Anton, R. In situ RHEED, AFM, and REM investigations of the surface recovery of MBE grown GaAs (0 0 1)-layers during growth interruptions. Journal of Crystal Growth 193 (1998) : 451-459.
- [74] Daruka, I., and Barabasi, A.L. Dislocation-free island formation in heteroepitaxial growth: A study at equilibrium. Physical Review Letters 79 (1997) : 3708-3711.
- [75] Lee, J.W., Schuh, D., Bichler, M., and Abstreiter, G. Advanced Study of Various Characteristics Found in RHEED Patterns During The Growth of InAs Quantum Dots on GaAs (001) Substrate by Molecular Beam Epitaxy. Applied Surface Science 228 (2004) : 306-312.
- [76] Suraprapapich, S., Thainoi, S., Kanjanachuchai, S., and Panyakeow, S. Self-Assembled Quantum Dot Molecules by Molecular-Beam Epitaxy. Journal of Vacuum Science Technology B 23 (2005) : 1217-1220.
- [77] Kiravittaya, S., Nakamura, Y., Schmidt, O.G. Photoluminescence linewidth narrowing of InAs/GaAs self-assembled quantum dots. Physica E 2002; 13: 224-228.
- [78] Wang, S.M., and et al. Localized formation of InAs quantum dots on shallow-patterned GaAs(100). Applied Physics Letters 88 (2006): 233102(1)-233102(3).

- [79] Kiravittaya, S., Homogeneity Improvement of InGaAs/GaAs Self-assembled Quantum Dots Grown by Molecular Beam Epitaxy. Ph.D.'s thesis, Department of Electrical Engineering Faculty of Engineering Chulalongkorn University, 2002.
- [80] Thet, C.C., Panyakeow, S., and Kanjanachuchai, S. Growth of InAs quantum-dot hatches on InGaAs/GaAs cross-hatch virtual substrates, Microelectronic Engineering 84 (2007) : 1562–1565.
- [81] Kanjanachuchai, S., Maitreeboriraks, M., Thet, C.C., Limwongse, T., and Panyakeow, S. Self-assembled InAs quantum dots on cross-hatch InGaAs templates: Excess growth, growth rate, capping and preferential alignment. Microelectronic Engineering 86 (2009) : 844–849.
- [82] Songmaung, R. Study on growth and In-situ processing of InAs self-organized quantum dots for long wavelength application. Ph.D.'s thesis, Department of Electrical Engineering Faculty of Engineering Chulalongkorn University, 2003.
- [83] Lee, S.J., Lee, J.I., Kim, M.D., and Noh, S.K. Photoluminescence study of InAs quantum dots with a bimodal size distribution. Journal of the Korean Physical Society 42 (May 2003): 686-690.
- [84] Krishna, S., Zhu, D., Xu, J., Linder, K.K., Qasaimeh, O., Bhattacharya, P., and Huffaker, D.L. Structural and luminescence characteristics of cycled submonolayer InAs/GaAs quantum dots with room-temperature emission at $1.3 \mu\text{m}$. Journal of Applied Physics 86 (1999) 6135-6138.
- [85] Chit Swe, N.T., , Optical polarization property of laterally aligned quantum dots. Ph.D.'s thesis, Department of Electrical Engineering Faculty of Engineering Chulalongkorn University, 2007
- [86] Gérard, J.M., Génin, J.B., Lefebvre, J., Moison, J.M., Lebouché, N., and Barthe, F. Optical investigation of the self-organized growth of InAs/GaAs quantum boxes. Journal Of Crystal Growth 150 (1995) : 351-356.

- [87] Heitz, R., Ramachandran, T.R., Kalburge, A., Xie, Q., Mukhametzhanov, I., Chen, P., and Madhukar, A. Observation of Reentrant 2D to 3D Morphology Transition in Highly Strained Epitaxy: InAs on GaAs. Physics Review Letters 78 (1997) : 4071-4074.
- [88] Duarte, C.A., and et al. Influence of the temperature on the carrier capture into self-assembled InAs/GaAs quantum dots. Journal Of Applied Physics 93 (2003) : 6279.
- [89] Sun, X., Liu, J., Kimerling, L.C., and Michel, J. Direct gap photoluminescence of n-type tensile-strained Ge-on-Si. Applied Physics Letters 95 (2009) : 011911(1)-011911(2)
- [90] Wohlert, D.E., Chou, S.T., Chen, A.C., Cheng, K.Y., and Hsieh, K.C. Observation of temperature-insensitive emission wavelength in GaInAs strained multiple-quantum-wire heterostructures. Applied Physics Letters 68 (1996) : 2386-2388.
- [91] Miyake, Y., Hirayama, H., Kudo, K., and Tamura, S. Room-temperature operation of GaInAs/GaInAsP/InP SCH lasers with quantum-wire size active region. IEEE Journal of Quantum Electronics 29 (1993) : 2123-2133.
- [92] Gammon, D., Rudin S., Reincke, T.L., Katzer, D.S., and Kyono, C.S. Phonon broadening of excitons in GaAs/Al_xGa_{1-x}As quantum wells. Physical Review B 51 (1995) : 16785-16789.
- [93] Varshni, Y.P. Temperature dependence of the energy gap in semiconductors. Physica 34 (1967) : 149-154.
- [94] Jeon, S.M., and et al. Influence of InAs Coverage on Transition of Size Distribution and Optical Properties of InAs Quantum Dots. ACTA Physica Polonica A 118 (2010) : 673-676.
- [95] Lu, X., Vaillancourt, J., and Wen, H. Temperature-dependent energy gap variation in InAs/GaAs quantum dots. Applied Physics Letters 96 (2010) : 173105.
- [96] Leon, R., Kim, Y., Jagadish, C., Gal, M., Zou, J., and Cockayne, D.J.H. Effects of interdiffusion on the luminescence of InGaAs/GaAs quantum dots. Applied Physics Letters 69 (1996) : 1888.

ประวัติผู้เขียนวิทยานิพนธ์



นายมติชนท์ ไมตรีบริรักษ์ เกิดเมื่อวันที่ 6 กุมภาพันธ์ พุทธศักราช 2528 อาศัยอยู่
บ้านเลขที่ 211/46 ถนนนนทรี แขวงช่องนนทรี เขตยานนาวา กรุงเทพมหานคร จบการศึกษาระดับ
มัธยมศึกษาจากโรงเรียนบดินทรเดชา (สิงห์ สิงหเสนี) ปีการศึกษา 2545 และจบการศึกษา
ระดับอุดมศึกษา ปริญญาวิศวกรรมศาสตรบัณฑิต สาขาวิศวกรรมไฟฟ้า จาก จุฬาลงกรณ์
มหาวิทยาลัย ปีการศึกษา 2549

