



Keizo KATO, Ph.D.

Professor

Program: Electrical and Information Engineering

Area: Electrical and Electronic Engineering

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Professional Expertise

His professional expertise encompasses electrical and electronic materials, electronic devices, organic ultrathin films, organic devices, and molecular electronics. His current research subjects are (1) fabrication and evaluation of organic ultrathin films, (2) optical and electrical properties of organic ultrathin films, (3) functional design and control of organized molecular ultrathin films, (4) applications of organic ultrathin films, and (5) development of organic devices. Evaluation and device applications of nanostructured organic thin films utilizing surface plasmon (SP) excitations are major topics in his laboratory.



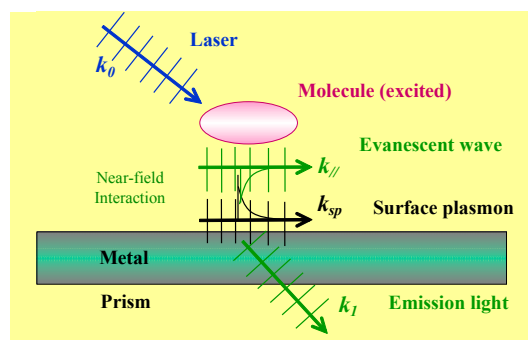
Flexible transistor fabricated in his laboratory.

Research Fields of Interest

He and his research group (Professor Kazunari Shinbo and Associate Professor Akira Baba) specially study on the attenuated total reflection (ATR) method utilizing SP excitations at the interface between metal and dielectric ultrathin films, that is, the SP resonance (SPR) method. The ATR (SPR) method is quite useful for evaluation of the dielectric ultrathin films and applications to sensors and novel plasmonic devices. Emission lights due to the SP excitations are observed through the prism in the Kretschmann configuration for the ATR method. The SP emission light properties strongly depend on the incident angles of laser lights, the emission angles of emission lights, and the thicknesses of dielectric and metal ultrathin films. The SP emission lights are also related to the photoluminescence of the luminescent molecules. The SP emission lights are useful for application to new organic devices.



ATR (SPR) measuring system.



SP emission lights due to molecular luminescence.

Education

1987: D. Eng. in Electrical and Electronic Engineering, Tokyo Institute of Technology, Japan

1984: M. Eng. in Electrical and Electronic Engineering, Tokyo Institute of Technology, Japan

1982: B. Eng. in Electrical and Electronic Engineering, Tokyo Institute of Technology, Japan

Professional Societies and Activities

1. Senior Member, The Institute of Electrical Engineers of Japan
2. Senior Member, The Institute of Electronics, Information and Communication Engineers
3. Member, The Laser Society of Japan
4. Member, IEEE

Major Publications

Papers

- [1] "Improvement of On/Off Ratio in Organic Field-Effect Transistor Having Thin Molybdenum Trioxide Layer", IEICE Trans. Electron., Vol.E98-C, pp.98-103, 2015.
- [2] "Enhanced Photocurrent Generation at a Spiro-OMeTAD/AuNPs-TiO₂ Interface with Grating-Coupled Surface Plasmon Excitation", IEICE Trans. Electron., Vol.E98-C, pp.104-109, 2015.
- [3] "Evaluation of a PAH/PSS Layer-by-Layer Deposited Film Using a Quartz-Crystal-Microbalance and Surface-Plasmon-Resonance Hybrid Sensor", IEICE Trans. Electron., Vol.E98-C, pp.136-138, 2015.
- [4] "In Situ Study of Electropolymerized Poly (3-aminobenzoic acid) Thin Film on BD-R and DVD-R Grating Substrates by Electrochemical-Transmission Surface Plasmon Resonance Spectroscopy", International Journal of Polymer Science, ID 650516 (7 pages), 2015.
- [5] "Investigation of Localized Surface Plasmon/Grating-coupled Surface Plasmon Enhanced Photocurrent in TiO₂ Thin Films", Phys. Chem. Chem. Phys., Vol.16, pp.24484-24492, 2014
- [6] "Long-range Surface Plasmon Resonance Immunosensor Based on Water-stable Electrospun Poly(acrylic acid) Fibers", Sensors and Actuators B: Chemical, Vol.204, pp.770-776, 2014.
- [7] "Multiple Plasmonic Effect on Photocurrent Generation of Metal-loaded Titanium Dioxide Composite/Dye Films on Gold Grating Surface", Surface and Interface Analysis, Vol.46, pp.607-61, 2104.
- [8] "Distance-Dependent Surface Plasmon Resonance Coupling between a Gold Grating Surface and Silver Nanoparticles", Plasmonics, Vol.9, Issue 4, pp.899-905, 2014.
- [9] "Au-Loaded Titanium Dioxide Nanoparticles Synthesized by Modified Sol-Gel/Impregnation Methods and Their Application to Dye-Sensitized Solar Cells", International Journal of Photoenergy, Article ID 865423 (8 pages), 2014.
- [10] "Electrochemically Controlled Detection of Adrenaline on Poly(2-aminobenzylamine) Thin Films by Surface Plasmon Resonance Spectroscopy and Quartz Crystal Microbalance", Surface and Interface Analysis, Vol.45, pp.1661-1666, 2013.
- [11] "Fabrication of Thin Film from Conducting Polymer/Single Wall Carbon Nanotube Composites for the Detection of Uric Acid", Mol. Cryst. Liq. Cryst., Vol.580, pp.1-6, 2013.
- [12] "Fabrication of Carboxylated Conducting Polymer/CNTs Composites Thin films for Immunosensor Application", Mol. Cryst. Liq. Cryst., Vol.580, pp.7-14, 2013.
- [13] "Electrochemically Fabricated Pyrrole Copolymer Thin Films and Their Electroactivity in Neutral Aqueous Solution", Mol. Cryst. Liq. Cryst., Vol.580, pp.29-34, 2013.
- [14] "Transmission Surface Plasmon Resonance Signal Enhancement via Growth of Gold Nanoparticles on a Gold Grating Surface", Plasmonics, Vol.8, pp.369-375, 2013.
- [15] "Fabrication of a Quartz-Crystal-Microbalance/Optical-Waveguide Hybrid Sensor and In Situ Evaluation of Vacuum-Evaporated Lead Phthalocyanine Thin Film", Jpn. J. Appl. Phys., Vol.52, 05DC20 (5 pages), 2013
- [16] "Enhanced Photocurrent Properties of Dye/Au-loaded TiO₂ Films by Grating-coupled Surface Plasmon Excitation", IEICE Trans. Electron., Vol.E96-C, pp.385-388, 2013.
- [17] "Controlling Surface Plasmon Optical Transmission with Electrochemical Switch Using Conducting Polymer Thin Films", Advanced Functional Materials, Vol.22, pp.4383-4388, 2012.
- [18] "Solution-based Fabrication of Gold Grating Film for Use as a Surface Plasmon Resonance Sensor Chip", Sensors and Actuators B: Chemical, Vol.173, pp.316-321, 2012
- [19] "Mechanism behind Improved Apparent Field-Effect Mobility in Pentacene Thin-Film Transistors with Thin Molybdenum Trioxide Layer", Jpn. J. of Appl. Phys., Vol.51, 101601 (5pages) 2012.
- [20] "In situ Electrochemical-Transmission Surface Plasmon Resonance Spectroscopy for Poly(pyrrole-3-carboxylic acid) Thin-Film-Based Biosensor Applications, ACS Appl. Mater. Interfaces, Vol. 4, pp.4270-4275, 2012.
- [21] "Optical Near-field Excitation Using Liquid Crystals on Nanostructured Photoreactive Molecular Thin Films", Science China-Physics Mechanics & Astronomy, Vol. 55, pp.1351-1355, 2015.
- [22] "Fabrication of a Quartz-Crystal-Microbalance/Surface-Plasmon-Resonance Hybrid Sensor and Its Use for Detection of Polymer Thin-Film Deposition and Evaluation of Moisture Sorption Phenomena", Applied Physics Express Vol.5, 036603 (3 pages), 2012.
- [23] "Nano-structured Organic Devices and Biosensors Utilizing Evanescent Waves and Surface Plasmon Resonance Date of Evaluation", IEICE Trans. Electron., Vol.E94-C, No.12, pp.1824-1831, 2011.
- [24] "Humidity Detection by Using a Hybrid Sensor Employing Optical Waveguide Spectroscopy and Quartz Crystal Microbalance", IEICE Trans. Electron., Vol.E94-C, No.12, pp.1851-1854, 2011
- [25] "Increased Short-Circuit Current in Grating-Coupled Surface Plasmon Resonance Field-Enhanced Dye-Sensitized Solar Cells", J. Mater. Chem., Vol.21, pp.16436-16441, 2011.
- [26] "Grating-Coupled Surface Plasmon Enhanced Short-Circuit Current in Organic Thin-Film Photovoltaic Cells", ACS Appl. Mater. Interfaces, Vol. 3, pp.2080-2084, 2011.
- [27] "Fabrication of Fluorescence Tunable Electrospun Conjugated Polycarbazole Fibers Containing Gold Nanoparticles", J. Nanoscience and Nanotechnology, Vol.11, pp.4289-4294, 2011.
- [28] "Detection of Human IgG on Poly(pyrrole-3-carboxylic acid) Thin Film by Electrochemical-Surface Plasmon Resonance Spectroscopy", Jpn. J. Appl. Phys., Vol. 50, 01BK02 (6 pages), 2011.
- [29] "Multiple Vapor Sensing Using Waveguide-based Surface Plasmon Resonance Sensor", Jpn. J. Appl. Phys., Vol.50, 01BC15 (5 pages), 2011.
- [30] "Surface Plasmon Excitation and Emission Light Properties Using Hybrid Setup of Prism and Grating Coupling", IEICE Trans. Electron., Vol.E94-C, No.2, pp.196-197, 2011.

Book Chapters

- [1] Kato K., 2010, "Surface Plasmon Excitations and Emission Lights in Nanostructured Organic Films", *Nanoscale Interface for Organic Electronics*, World Scientific Publishing Co., Singapore, pp.243-272 (Chapter 12).