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Surface plasmon enhanced energy conversion

Plasmonic structures have attracted intensive attention in recent years due to their novel properties and high potential for a wide range of applications. One of them is the exceptional ability to confine light in an extremely small volume which has proved useful in improving the performances of solar cells and photodetectors. In this talk, I will share with you our recent work on split ring resonators (SRRs) array and surface plasmon enhanced energy conversion. With the process we developed, we have demonstrated two- and three- dimensional SRR arrays with controllable magnetic and electrical resonant wavelength from longwave infrared to near ultraviolet, and investigated their application for biochemical sensing. By integrating a 2-dimensional plasmonic structure with semiconductor heterojunction photodiode, we have realized strong enhancement in mid-wave infrared absorption and made them workable at room temperature. A room temperature detectivity of 8×10^9 Jones has been demonstrated. We also invented two-terminal millimeter wave photodetectors based on fast transportation of SPP induced non-equilibrium electrons. A noise equivalent power of 1.5×10^{-13} W Hz^{-1/2} has been achieved.

Biography

Dao Hua Zhang received his MSc degree from Shandong University and a Ph.D. degree from the University of New South Wales. He joined the School of Electrical and Electronics Engineering, Nanyang Technology, Singapore in 1991 and is currently a professor, Deputy Director of Centre of Excellence for Semiconductor Lighting and Displays, Program Director of Photonic Nano-Structures and Applications. Professor Zhang's main research interests include semiconductor materials, devices, and technology, photonic metamaterials and applications. He has successfully completed over 20 research projects including the first \$10M Competitive Research Program (CRP) of NTU as Lead PI. He has published over 470 papers in international journals (including Nature Communications, Light: Science and Application, Advanced Materials, Small, Advanced Optical Materials, ACS Photonics, Nanoscale and Scientific Reports) and international conferences, 6 books/proceedings, and 3 book chapters. He is Fellow of Institute of Physics, and Fellow of Institution of Engineering and Technology.

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