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Surface plasmon enhanced energy conversion

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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 x 109 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. 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 x 109 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.