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Surface plasmon-enhanced UV-emission from ZnO by aluminum bowtie nanoantenna arrays

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Abstract

Aluminum bowtie nanoantenna arrays fabricated by colloid lithography followed by oxygen plasma processing were used to demonstrate the localized-surface-plasmon enhancement of UV light emission from ZnO grown by atomic layer deposition. 4-fold photoluminescence enhancement in the peak of the near band edge emissions was obtained by introducing Al nanotriangles with the gap distance of 31nm by accurate control of the time of oxygen plasma treatment. Extinction spectra and theoretical simulations showed that this improvement benefited from the resonance coupling between the surface plasmons and the excitons of ZnO and the tremendously elevated local electromagnetic fields across the gaps. This cost-effective and facile approach paves an attractive way for high performance optoelectronic devices.

Keywords: plasmonics; ZnO; aluminum; bowtie nanoantenna arrays; colloid lithography