

Hetero-Oligomer Nanoparticle Arrays for Plasmon-Enhanced Hydrogen Sensing

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The ability to tune each nanoparticle in a plasmonic hetero-oligomer can reveal new architectures for plasmon-enhanced applications. In this work, a large-area nanofabrication approach, Reconstructable Mask Lithography (RML), was developed to achieve independent control over the size, position, and material of up to four nanoparticles within a subwavelength unit. Arrays of plasmonic hetero-oligomers consisting of strong plasmonic materials (Au) and reactant-specific elements (Pd) provide a unique platform for enhanced hydrogen gas sensing. Au-Pd nanoparticle dimers showed a red-shift and Au-Pd trimers with touching Au and Pd nanoparticles showed a blue-shift upon exposure to both high and low concentrations of hydrogen gas. Both Au-Pd hetero-oligomer sensors displayed high sensitivity, fast response times, and excellent recovery.

