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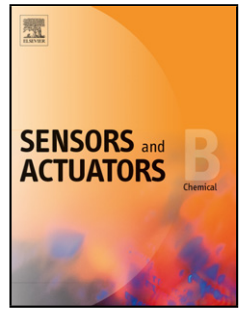

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Multispectral spatial and frequency selective sensing with ultra-compact cross-shaped antenna plasmonic crystals

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ABSTRACT:

We predict a novel multispectral spatial and frequency selective sensing based on a plasmonic sub-diffraction-limited (< $\lambda/4$) nanostructure. Via combining the strong plasmon near-field coupling effects, particle plasmon resonances (PPRs) and their hybridization by the metallic cross-shaped antennas (CSAs), a total of seven resonances with the minimum bandwidth < 7 nm are obtained in the visible and near-infrared region. Remarkably distinct biosensing behaviors at different spatial locations and different resonant wavelengths are simultaneously achieved, suggesting a new impressive sensing motif. High-quality biosensing with the maximal sensitivity (S = 1134 nm/RIU), figure of merit (FoM~71.4), and high contrast ratio of spectral intensity difference (ΔR = 44.2%) can be attained by detection a slight refractive index change of a thin biomolecular layer. These unique features of the proposed sensing motif could provide a powerful approach to develop desirable plasmon sensors with simultaneous multispectral spatial and frequency selective sensing, and hold potential applications in the high-integrated components for the high-performance plasmonic biosensing, detection and imaging.

Keywords:
Surface plasmon
Optical sensor
Spatial and frequency selective sensing
Multispectral
Plasmonic crystal
Antenna

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