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Hyperspectral Imaging Measurement of Nanomaterials as a High-Resolution Single-molecule Sensor

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Summary

The detection of single molecules in nanoscale is promising new venues of research. Single-molecule detection has been studied using a variety of different methods. Among them, the hyperspectral imaging system (HSI) stands out as a method that can measure the full spectrum of each point in the sample image. Another significant advantage is that these nanosensors work in a 3D space with a high resolution, thereby enabling live cell process monitoring.

In this study, the hyperspectral imaging system (HSI) use designed and installed to detect various target molecules with multiplexing ability. Multiplexing ability of the HSI due to characteristic spectra of different materials and their structures is proposed to dynamically monitor the nanoscale processes and the change of environmental conditions, such as temperature and refractive index. Raman spectroscopy and Dark-field spectroscopy are mainly used for different purposes: Raman spectra can be used as a powerful tool especially for multiplexing detection and chemical identification with well-defined resolution, and Dark-field spectrum is good for motion tracking of dimer interaction in the range of distance from a few nanometers to 100 nm. Many different nanomaterials with spectral features in their response to the optical excitation have been employed as nanoprobes for HSI applications. This study particularly focuses on the gold nanoparticle and the control of its surface plasmon resonance by forming a regulated structure.

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