Development of super-resolution microscopy technique and its applications

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The past decade has witnessed the development of super-resolution microscopy (SRM), a research field recognized with the Nobel Prize in Chemistry in 2014, which overcomes the diffraction-based far-field resolution limits of conventional light microscopy. The new opportunities afforded by SRM have motivated extensive research, providing multidimensional, multi-scale, and corroborated information about a system's morphology, functionality, dynamics, cellular context, and chemical composition. In this presentation, I will introduce our technology development and recent applications of the SRM technique. Using this approach, we investigated the biogenesis of extracellular vesicles in gram-positive bacteria and their direct interaction with human host cells. We also developed the super-resolution imaging method for nanopatterns in semiconductor and the single-molecule chemical sensing for phase separation in the polymer blend film. Our approach will open the door to the simultaneous nanoscale structural imaging and local sensing of surface and soft-matter systems inaccessible to current methods.