Plasmonics for Advanced Mid-Infrared Spectroscopy and Nano-BioSensor Systems

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Abstract (Özet)

Plasmonics, by localizing light to the sub-wavelength volumes and dramatically enhancing local fields, is enabling myriad of exciting opportunities for construction of novel photonic devices and systems. In this talk, Dr. Altug will present her research team's recent work on integrated plasmonics and metamaterials and their applications.

Dr. Altug will first introduce an ultrasensitive infrared nanospectroscopy technique. Infrared spectroscopy, which directly accesses vibrational fingerprints of the biomolecular/chemicals in mid-IR frequencies, is a powerful identification and analysis tool. Severeal Its low sensitivity, however, limits the wide applicability of the technique. By precise nanoengineering of infared antenna arrays, she will demonstrate that vibrational signatures of proteins can be enhanced by more than 100,000 times thus enabling spectroscopy from very low quantities of molecules. She will also present the first demonstration of time-resolved in-situ infrared spectrscopy of protein- protein intreactions through the use of specially tailored nanoantennas that are integrated with on-chip microfluidics system. These studies are opening up a new paradigm in vibrational spectroscopy and paving the way for a new class of measurements critical for understanding of basic biological functions that are importnat for disease progression and treatment.

For bio-sensors operating at low analyte concentrations, relying only on diffusion to transport analytes to the device surface severely limits the sensor performance. Dr. Altug will show that by uniquely merging nanophotonics and nanofluidics on the same platform, one can address this use and dramatically improve sensor response times. She will also show that sub-wavelength optofluidic sensors can sensitively and reliably detect live and intact viruses in biological media at medically relevant concentrations.

Dr. Altug will then introduce a new nanofabrication method enabling high-throughput, large area and low-cost fabrication of nanophotonic devices and metamaterials. She will also show that this method can enable high-resolution nanoplasmonis on flexible, stretchable and non-planar surfaces.

Keywords (Anahtar kelimeler): nanophotonics, plasmonics, metamaterials, infared, vinrational spectroscopy, bio-chemical sensor, microfluidics.

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