1. Adı Soyadı: Mustafa YORULMAZ
2. Unvanı: Doç. Dr.

DENEYİM

1- Project Manager (ASELSAN)
May 2019 – Şu Anda10 ay
Ankara, Turkey
- Development of optical biosensors
- Design and production of active and passive microfluidic systems
- Production of multiplexed protein microarrays
- Development of optical biosensors
- Design and production of active and passive microfluidic systems
- Production of multiplexed protein microarrays

2- Senior Research Scientist
(ASELSAN)
Haz 2017 – Şu Anda2 yıl 9
ay Ankara, Turkey
-Applications of single-particle imaging and spectroscopy to biosensors
-Interferometric detection of biological nanoparticles
-Single molecule biosensing
-Microfluidic chip development and manufacturing
-Improving resolution and contrast of optical images using coupled
deep autoencoders
-Applications of single-particle imaging and spectroscopy to biosensors
-Interferometric detection of biological nanoparticles
-Single molecule biosensing-Microfluidic chip development and manufacturing
-Improving resolution and contrast of optical images using coupled
deep autoencoders

3- Project Manager (ASELSAN)
Haz 2017 – Şub 20191
yıl 9 ay Ankara, Turkey
-New frontier in diagnostics: Digital Protein Microarrays
-Widefield Interferometric Microscopy
-Protein microarrays
-Multiplexed detection of individual proteins
-New frontier in diagnostics: Digital Protein Microarrays
-Widefield Interferometric Microscopy
-Protein microarrays
-Multiplexed detection of individual proteins

4- Research Scientist (ASELSAN)
Oca 2016 – May 20171 yıl 5 ay
Ankara, Turkey

Setting up Biotechnology Research
Laboratory Setting up Biotechnology
Research Laboratory

5- Associate Professor
ÜAK

6- Postdoctoral Fellow
Rice University
-Single-particle absorption spectroscopy by photothermal contrast.
-Hyperspectral darkfield scattering spectroscopy to investigate electrochemical tuning of surface plasmon resonance.
-Active control of plasmon through reduction and chloridation of silver metal on individual gold nanoparticles.
-Single-particle absorption spectroscopy by photothermal contrast.
-Hyperspectral darkfield scattering spectroscopy to investigate electrochemical tuning of surface plasmon resonance.
-Active control of plasmon through reduction and chloridation of silver metal on individual gold nanoparticles.

7- Leiden University

a- **Postdoctoral Fellow Tem 2013 – Oca 20147 ay**
Hollanda
a. Single-particle spectroscopy of individual gold nanorods for applications in soft- matter studies: Studying contact mechanics of two curved glass substrates.
b. Photothermal microscopy of single gold nanoparticles to investigate thermodynamic processes at
the nanoscale: Studying explosive formation and dynamics of vapor nanobubbles.
c.Single-particle spectroscopy of individual gold nanorods for applications in soft- matter studies: Studying contact mechanics of two curved glass substrates.
d. Photothermal microscopy of single gold nanoparticles to investigate thermodynamic processes at
the nanoscale: Studying explosive formation and dynamics of vapor nanobubbles.

b- PhD
Tem 2009 – Haz 20134 yıl
MoNOS
-Combined photothermal (absorption) and fluorescence microscopy for studying
photophysical properties of single gold nanoparticles.
-Optical spectroscopy of single gold nanorods and its application in soft matter studies.
-Combined photothermal (absorption) and fluorescence microscopy for

studying
photophysical properties of single gold nanoparticles.
-Optical spectroscopy of single gold nanorods and its application in soft matter studies.

8- MS**c**
Koç University
2007 – 20092 yıl
Nano-Optics Research Laboratory
Total Internal Reflection Fluorescence microscopy for investigating diffusion dynamics of single terrylene molecules in confined geometries of diblock copolymer thin films.
Total Internal Reflection Fluorescence microscopy for investigating diffusion dynamics of single terrylene molecules in confined geometries of diblock copolymer thin films.

9- BS
Bilkent University
2005 – 20072 yıl
Demir Research Group, Devices&Sensors Research Lab
-Optical design of waveguides for operation in the visible and infrared spectral range
-Simulation studies for novel wireless bio-implant RF-MEMS sensors
-Optical design of waveguides for operation in the visible and infrared spectral range
-Simulation studies for novel wireless bio-implant RF-MEMS sensors

EĞİTİM

1- Leiden University
Leiden University
Doctor of Philosophy (PhD)Physics 2009 – 2013

2- Koç University
Master of Science (MS)Materials Science and Engineering 2007– 2009

3- Bilkent University
Bilkent University
Bachelor of Science (BS)Physics 2002 – 2007

YAYINLAR

1- Absorption Spectroscopy of an Individual Fano Cluster
Nano Letters26 Eylül 2016
Plasmonic clusters can exhibit Fano resonances with unique and tunable asymmetric line shapes, which arise due to the coupling of bright and dark plasmon modes within each multiparticle structure. These structures are capable of generating remarkably large local electromagnetic field enhancements and

should give rise to high hot carrier yields relative to other plasmonic nanostructures. While the scattering properties of individual plasmonic Fano resonances have been characterized extensively both experimentally and theoretically, their absorption properties, critical for hot carrier generation, have not yet been measured. Here, we utilize single- particle absorption spectroscopy based on photothermal imaging to distinguish between the radiative and nonradiative properties of an individual Fano cluster. In observing the absorption spectrum of individual Fano clusters, we directly verify the theoretical prediction that while Fano interference may be prominent in scattering, it is completely absent in absorption. Our results provide microscopic insight into the nature of Fano interference in systems of coupled plasmonic nanoparticles and should pave the way for the optimization of hot carrier production using plasmonic Fano clusters.

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2- Single-Particle Absorption Spectroscopy by Photothermal Contrast
Nano Letters2015

Removing effects of sample heterogeneity through single-molecule and single-particle techniques has advanced many fields. While background free luminescence and scattering spectroscopy is widely used, recording the absorption spectrum only is rather difficult. Here we present
an approach capable of recording pure absorption spectra of individual nanostructures. We demonstrate the implementation of single-particle absorption spectroscopy on strongly
scattering plasmonic nanoparticles by combining photothermal microscopy with a supercontinuum laser and an innovative calibration procedure that accounts for chromatic aberrations and wavelength-dependent excitation powers. Comparison of the absorption spectra to the scattering spectra of the same individual gold nanoparticles reveals the blueshift of the absorption

spectra, as predicted by Mie theory but previously not detectable in extinction measurements that measure the sum of absorption and scattering. By covering a wavelength range of 300 nm, we are furthermore able to record absorption spectra of single gold nanorods with different aspect ratios. We find that the spectral shift between absorption and scattering for the longitudinal plasmon resonance decreases as a function of nanorod aspect ratio, which is in agreement with simulations.

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an approach capable of recording pure absorption spectra of individual nanostructures. We demonstrate the implementation of single-particle absorption spectroscopy on strongly
scattering plasmonic nanoparticles by..

3- Single-Particle Spectroscopy Reveals Heterogeneity inElectrochemical Tuning of the Localized Surface Plasmon

Journal of Physical Chemistry B8 Temmuz 2014

A hyperspectral imaging method was developed that allowed the identification of heterogeneous plasmon response from 50 nm diameter gold colloidal particles on a conducting substrate in a transparent three-electrode spectroelectrochemical cell under non-Faradaic conditions. At cathodic potentials, we identified three distinct behaviors from different nanoparticles within the same sample: irreversible chemical reactions, reversible chemical reactions, and reversible charge density tuning. The irreversible reactions in particular would be difficult to discern in alternate methodologies. Additional heterogeneity was observed when single nanoparticles demonstrating reversible charge density tuning in the cathodic regime were measured dynamically in anodic potential ranges. Some nanoparticles that showed charge density tuning in the cathodic range also showed signs of an additional chemical tuning mechanism in the anodic range. The expected changes in nanoparticle free-electron density were modeled using a charge density-modified Drude dielectric function and Mie theory, a commonly used model in colloidal spectroelectrochemistry. Inconsistencies between experimental results and predictions of this common physical model were identified and highlighted. The broad range of responses on even a simple sample highlights the rich experimental and theoretical playgrounds that hyperspectral single-particle electrochemistry opens.

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4- A Plasmonic Biosensor with Single-molecule Sensitivity

Optical Sensors14 Temmuz 2013

The plasmon resonance of a single metal nanoparticle induces an enhancement of the local electromagnetic field. We exploit this field enhancement to detect single molecules that are (1) poorly fluorescent or (2) completely non-fluorescent.

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5- Thousand-fold Enhancement of Single-Molecule Fluorescence Neara Single Gold Nanorod

Angewandte Chemie International Edition21 Ocak 2013

Large enhancements of single-molecule fluorescence up to 1100 times by using synthesized gold nanorods are reported (see picture). This high enhancement is achieved by selecting a dye with its adsorption and emission

close to the surface plasmon resonance of the gold nanorods.
Large enhancements of single-molecule fluorescence up to 1100 times by using synthesized gold nanorods are reported (see picture). This high enhancement is achieved by selecting a dye with its adsorption and emission close to the surface plasmon resonance of the gold nanorods.

6- Luminescence Quantum Yield of Single Gold Nanorods
Nano Letters9 Temmuz 2012
We study the luminescence quantum yield (QY) of single gold nanorods with different aspect ratios and volumes. Compared to gold nanospheres, we observe an increase of QY by about an order of magnitude for particles with a plasmon resonance >650 nm. The observed trend in QY is further confirmed by controlled reshaping of a single gold nanorod to a spherelike shape. Moreover, we identify two spectral components, one around 500 nm originating from a combination of interband transitions and the transverse plasmon and one coinciding with the longitudinal plasmon band. These components are analyzed by correlating scattering and luminescence spectra of single nanorods and performing polarization sensitive measurements. Our study contributes to the understanding of luminescence from gold nanorods. The enhanced QY we report can benefit applications in biological and soft matter studies.
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7- Room-Temperature Detection of a Single Molecule's Absorption by Photothermal Contrast
Science15 Ekim 2010
So far, single-molecule imaging has predominantly relied on fluorescence detection. We imaged single nonfluorescent azo dye molecules in room-temperature glycerol by the refractive effect of the heat that they release in their environment upon intense illumination. This photothermal technique provides contrast for the absorbing objects only, irrespective of scattering by defects or roughness, with a signal-to-noise ratio of ~10 for a single molecule in an integration time of 300 milliseconds. In the absence of oxygen, virtually no bleaching event was observed, even after more than 10 minutes of illumination. In a solution saturated with oxygen, the averagebleaching time was of the order of 1 minute. No blinking was observed in the absorption signal. On the basis of bleaching steps, we obtained an average absorption cross section of 4 angstroms2 for a single chromophore.
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