EDGE MEETING ABSTRACT SUBMISSION FORM

Clearly indicate your choice of presentation:

☐ Give a talk

☒ Give a poster or a talk

☐ Present a poster only

Corresponding author: Franz Philipp Schmidt

E-mail address of corresponding author: franz.schmidt@felmi-zfe.at

EDGE MEETING ABSTRACT SUBMISSION FORM

Mapping surface plasmons in the nanometer regime

Franz-Philipp Schmidt[1,2], Harald Ditlbacher[2], Ulrich Hohenester[2], Ferdinand Hofer[1], and Joachim R. Krenn[2]

[1] Institute for Electron Microscopy and Nanoanalysis (FELMI), Graz University of Technology, 8010 Graz, Austria
[2] Department of Physics, University of Graz, 8010 Graz, Austria

Surface plasmons are density waves of electrons, which are propagating at a metallic surface. They are generated at optical frequencies and show confinement into areas much smaller than the wavelength of light, which causes a strong increase of the electric field intensities. This enhancement is especially pronounced in case of nanometer sized metal particles. Various applications, ranging from novel light sources, photovoltaics to sensor devices take advantage of the extraordinary optical properties of such metallic nanoparticles.

We studied different nanostructures from disks and triangles to rectangles using the STEM-EELS method in a monochromated scanning transmission electron microscope (Tecnai F 20) [1]. The electron energy-loss was measured in order to get spatially resolved spectral information from the near-infrared, the visible and the UV range. These nanoparticles of different shapes were designed using electron beam lithography, a technique suitable of creating thousands of nanostructures in just a few minutes.

In this study we present experimental results about the observation of various plasmonic modes and their spatial distribution in dependence on different particle geometries. Theoretical calculations are in very good agreement with the experiments and help to understand these findings. Furthermore we show that this multitude of observed localized modes can be reduced to two main excitations, so called film and edge plasmons, which follow different dispersion relations.

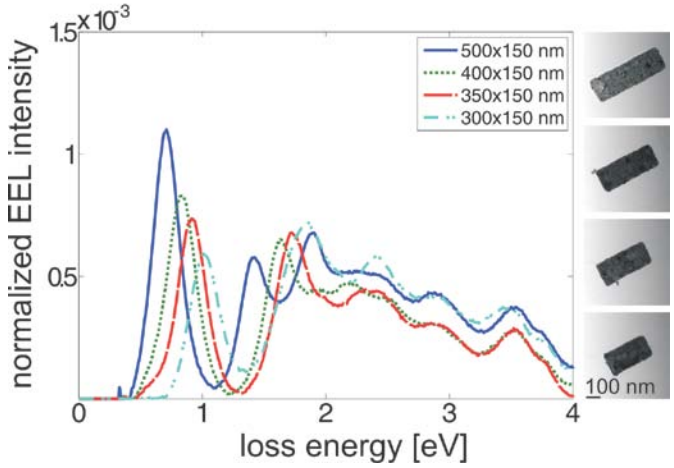

FIG. 1. Zero loss subtracted EEL spectra extracted from spectrum images which were measured on 30 nm thick silver rectangles on a 15 nm Si_3N_4 substrate.

References

[1] F.P. Schmidt et al., *Nano Lett.* 12 (2012) 5780.

[2] The authors gratefully acknowledge funding from the Austrian Science Fund under grant number P21800-N20 and the Graz Centre for Electron Microscopy.