

PHOTON EMISSION FROM SILVER WHISKERS INDUCED BY A HIGH-ENERGY ELECTRONS.

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When an incident electron passes through or near a metallic material, it induces surface charge oscillations, and in particular resonances such as surface plasmons. If the dielectric loss is negligible, the entire energy lost by the incident electron is transferred to radiative events, and therefore, photon emission by surface plasmons is closely connected with the electron energy loss process of incident electrons.

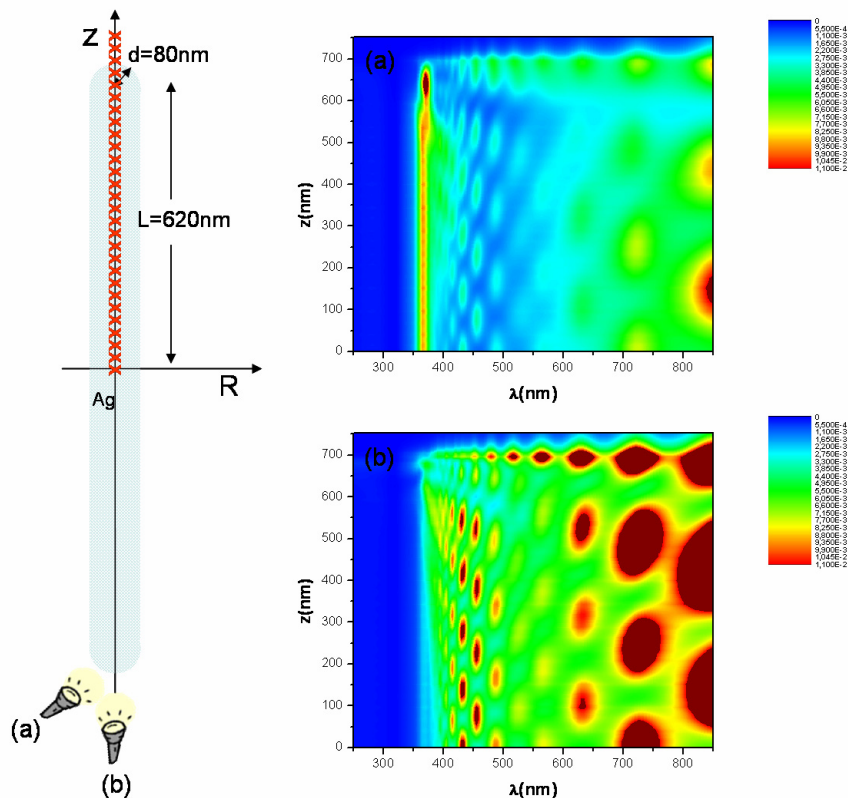
The main purpose of this work is to analyze photon emission from a whisker of silver induced by an energetic electron beam. The optical response of whiskers is calculated by means of the boundary element methods in a full electromagnetic calculation [1] and compared with recent electron microscope measurements. It will be shown that the features of the emission spectra and photon maps depend on the polarization direction of the emitted light and that this technique provides a strong selectivity of the spatial patterns of such plasmon excitations in metallic particles [2].

References

[1] F. J. García de Abajo and A. Howie, Phys. Rev. Lett. **80**, 5180 (1998).

[2] N. Yamamoto, K. Araya, and F. J. García de Abajo, Phys. Rev. B **64**, 205419 (2001).

Figures:



Contour plot of the emitted light of a whisker for s-polarization (a) and p-polarization (b) in a distance-wavelength (z - λ) map. As we can see, the behaviour of the resonant modes is strongly dependent on the polarization direction. The red marks on the sketch of the whisker indicate the region ($z>0$, $R=0$) considered to calculate the maps.