

PEEM transients during growth of organic thin films

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Due to its sensitivity regarding the electronic structure of the surface and its time resolution, UV-PEEM is a very versatile tool to study the growth of organic thin films in real-time. The contrast between the initial layers can be related to the changes of the work function of the sample upon the adsorption of the organic molecules. [1] Here, we study the growth of three phthalocyanine molecules, namely CoPc, CuPc and F₁₆CuPc, on Ag(100) surfaces. During deposition of these molecules by thermal evaporation under ultra-high-vacuum condition, PEEM images (with Hg or Xe lamp as excitation source) are taken with a rate of 0.2 to 1 frames per second. From these movies the local electron yield (LEY) based on individual pixels, the mean electron yield (MEY) based on an entire image, and standard deviation are extracted and analyzed.

CoPc and CuPc show an increasing MEY upon deposition of the first monolayer; the deposition of a monolayer of F₁₆CuPc decreases the MEY. This points to the fact that a monolayer of CoPc or CuPc decreases the work function while F₁₆CuPc gives rise to the opposite effect. The data have been confirmed even quantitatively for CoPc by independent measurements of the changes of the work function via the Anderson method [2] and the Fowler-DuBridge equation.

To understand the evolution of the film morphology, the standard deviation within the image can give useful information. We will briefly discuss how image features smaller and larger than the PEEM resolution (here about 150 nm due to the large field of view) effect this value.

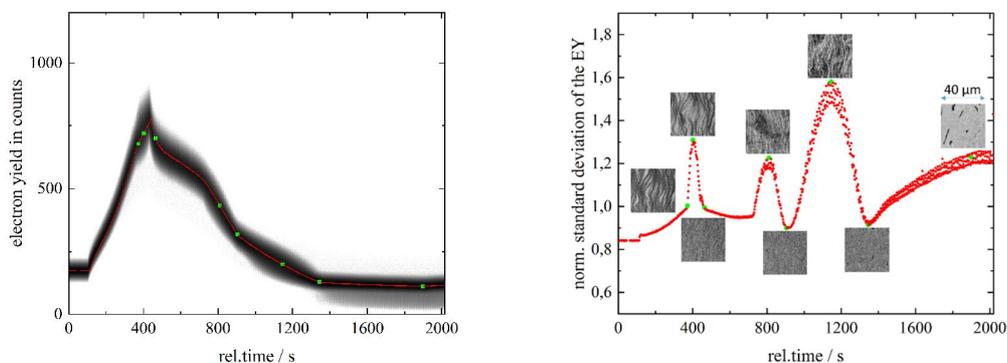


Figure 1. left: transient of the mean EY measured during CoPc deposition on a Ag(100) surface; right: associated transient of the normalized standard deviation of the EY. The insets show the corresponding PEEM images (40 μm.× 40 μm).

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References

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