Conjugated Polyelectrolytes – Synthesis, Properties and Use as Functional Interlayers of Electronic Devices

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The mission of organic electronics is to develop electronic and optoelectronic devices based on organic materials. The lecture presents a series of novel, conjugated polyelectrolytes (CPEs), including cationic, anionic as well as zwitterionic CPEs and their use as functional interlayers of organic electronics devices, especially bulk-heterojunction-type organic solar cells.

A key challenge towards stable and efficient organic solar cells is to develop solution-processed interlayers for improved and stable extraction of electrons and holes. The introduction of cationic CPE-based interlayers (until now mostly cathode interlayers) can lead to a significantly improved charge extraction to the electrode, both for conventional [1] and inverted device architectures [2-4].

Also novel anionic CPEs have been prepared and tested as anode interlayers [5].

References:

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Local Characterization of Ultrathin ZnO Layers on Ag(111) by STM and AFM

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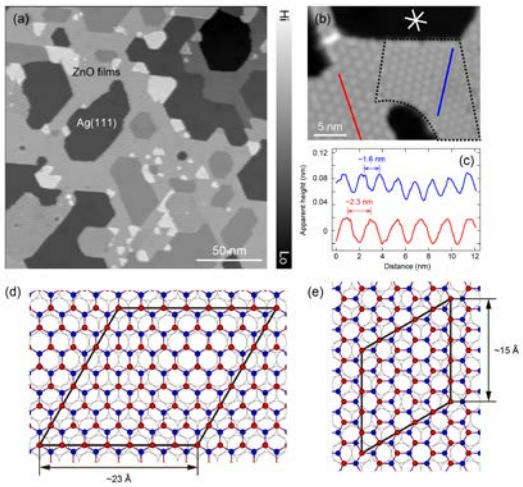
We have studied the local structure of ultrathin ZnO layers grown on Ag(111) by the reactive deposition method using low-temperature scanning tunneling microscopy (STM) and non-contact atomic force microscopy (nc-AFM) at 5 K [1]. The characteristic Moiré patterns, which are caused by the lattice mismatch between the ZnO(0001) layers and Ag(111) and assigned to the ZnO(0001)-(7×7)/Ag(111)-(8×8) and ZnO(0001)-(5×5)/Ag(111)-(3√3×3√3)R30° coincidence structures, appear only in STM, but not in nc-AFM images. This indicates an atomically flat geometrical structure of the ZnO layer and a pure electronic origin of the Moiré structures imaged by STM. The apparent height of ZnO layers in STM strongly depends on the bias voltage and becomes comparable with that obtained by nc-AFM, when the bias voltage is below the conduction band edge of the ZnO layers as determined by scanning tunneling spectroscopy. This allows to relate the apparent height in STM with the geometrical height. On the other hand, mapping the onset of the resonance state of the ZnO layer provides a basis for determining its thickness. Our results suggest that ZnO layers on Ag(111) grow predominantly as bi- and trilayers under the conditions used.



(a) STM overview image of ultrathin ZnO layers on Ag(111) (V_s = 1 V, I_t = 0.1 nA, 200 × 200 nm), revealing both bare Ag(111) areas and ZnO layers. The image was obtained at 5 K. (b) Enlarged STM image of the ZnO layer that shows the characteristic Moiré pattern aligned along the high-symmetry axes of Ag(111). The framed area (back dashed line) highlights the misaligned area. (c) Line profiles for the aligned (red) and misaligned (blue) Moiré area (indicated in Figure 1b). The latter profile is vertically offset for clarify. (d–e) Schematic of (d) ZnO(0001)-(7×7)/Ag(111)-(8×8) and (e) ZnO(0001)-(5×5)/Ag(111)-(3√3×3√3)R30° coincidence structures. The unit cell of the Moiré pattern (black line) is indicated. Blue, red, and gray squares represent Zn, O, and Ag atoms, respectively.

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