

# Growth of metal thin films on conductive polymer surfaces

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Type and structure of the metal electrode deposited on top of the active layer of an organic photovoltaic cell have a strong influence on the performance of the corresponding device. Therefore understanding of the structural growth of the metal layer and the interaction with the photoactive polymer layer is necessary.

We investigate the formation of a metal/polymer interface in-situ with grazing incidence small angle x-ray scattering (GISAXS) [1] during DC magnetron sputtering. Two model systems with completely different growth behaviour are focussed: 1) The deposition of gold on a poly(N-vinylcarbazole) surface [2] and 2) the growth of an aluminium layer on a poly(3-hexylthiophene) surface [3]. These in-situ GISAXS experiments allow us to follow the spatial growth of the metal clusters from the initial stage to the formation of a continuous layer and to determine the temporal evolution of the cluster morphology and layer growth. From these observations a growth model is derived, explaining the cluster growth within individual steps. Moreover, metal incorporation inside the semi-conducting polymer film is revealed with x-ray reflectivity measurements [2]. Atomic force microscopy measurements picturing the surface structure complement the investigation.

[1] **P. Müller-Buschbaum**: *A basic introduction to grazing incidence small angle X-ray scattering*; in Special issue of Lecture Notes in Physics on "Applications of Synchrotron Light to Noncrystalline Diffraction in Materials and Life Sciences", Vol. 776, ed. Ezquerra, T.A.; Garcia-Gutierrez, M.; Nogales, A.; Gomez, p.61-90 Springer Berlin, ISBN-13: 978-3-540-95967-0 (2009)

[2] **G. Kaune, M.A. Ruderer, E. Metwalli, W. Wang, S. Couet, K. Schlage, R. Röhlberger, S.V. Roth, P. Müller-Buschbaum**: *In-situ GISAXS study of gold film growth on conducting polymer films*; ACS Appl. Mater. Interfaces **1**, 353-360 (2009)

[3] **G. Kaune, M.A. Ruderer, E. Metwalli, R. Meier, S. Couet, K. Schlage, R. Röhlberger, S.V. Roth, P. Müller-Buschbaum**; *to be published*