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In-situ grazing incidence scattering in information and communication technology

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Novel functional materials rely on a profound understanding of nanoscale structure and processing. Employed as multilayered thin films and coatings, they find applications in smart sensors, organic electronics, organic photovoltaics and barrier layers. To create such organic and inorganic multilayers a multitude of deposition methods is used. These include processing from liquid phase, such as ink-jet printing, spray-coating, spin-coating, as well as vacuum deposition. Grazing incidence X-ray scattering (GIXS) is a very powerful tool to investigate processes in-situ and in-operando and in real-time [1,2,3]. GIXS allows for combining with micro- and nanofocused X-ray beams as well as complementary investigation tools at the same time. Therefore one obtains full structural and morphological understanding of functional materials and to correlate this knowledge with the desired functionality. I will present selected examples for application of GIXS in information and communication technology. This comprises vacuum deposition with millisecond time resolution and on functional materials. Combining GIXS and imaging ellipsometry, we are able to follow in-situ the installation of functional thin films by droplet casing. Furthermore, this powerful combination allows for examining the stability of nanostructure and optical constants in nanostructured polymeric films for high temperature applications. I complement my talk with the example of GIXS and spray deposition as one rapid deposition method to obtain functional coatings.

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