Nanocomposites of conductive polymers and functional nanoparticles have recently been employed in applications such as photodetectors [1-3]. The particles convert light or x-rays into charge-carrier combinations that travel through a polymer blend to the contacting electrodes. In order to correlate device performances with the distribution of the nanoparticles in the organic polymer matrix, it is necessary to perform structural investigation at particle-level resolution. Focused ion beam (FIB) sample preparation is a prerequisite when specific regions are to be analyzed at such resolutions. In this work, composites of P3HT, PCBM and PbS nanoparticles or other inorganic nanoparticles were prepared by spray coating. Trenches and lamellae were prepared via FIB at several positions of the sprayed area. Their microstructures were analyzed using transmission electron microscopy (TEM) and scanning electron microscopy (SEM).

The distribution of nanoparticles inside the nanocomposite affects the properties of electronic materials. Conductive pathways, optical adsorption lengths and optical scattering depend on particle arrangement and affect sensor performance. Agglomerates and fully demixed particle phases make it harder for charge carriers to enter the polymer blend. Voids in the composite hinder transport and scatter light. We discuss the occurrence of such defects depending on processing.

FIB cuts through the soft polymer matrix that intersect hard nanoparticles can cause artefacts in the microstructure such as ridges, grooves, etc. The high energy ion bombardment may lead to local melting or the creation of amorphous layers. We discuss ion-beam related artefacts and their dependence on the preparation. We studied the extent of beam damage by comparing FIB cuts with samples prepared differently (e.g. using a microtome).