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Transmission Kikuchi Diffraction characterization of low dimensional materials

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Since the first publication from Keller and Geiss [1] on transmission Kikuchi diffraction in the SEM, the technique has attracted considerable attention and has been applied to a variety of materials and samples [2]. A significant amount of this attention has been dedicated to complementing EBSD characterization with the improved spatial resolution provided by TKD, and to this end electron transparent samples from bulk materials were prepared. The characterization of low dimension materials such as, nanoparticles, nanowires and thin films, in the SEM using TKD has, however, not yet been well explored, but it has a large potential. Many samples, which have traditionally been investigated only with the TEM, due to their resolution requirements or their small volume or thickness, can now also be investigated by TKD in the SEM. Consequently, quantitative microstructural characterization over relatively large areas and with a spatial resolution in order of 2-10 nm [3] can be achieved. This potential is demonstrated in this presentation by means of two examples. In the first example the characterization of III-V nanowires by TKD is compared to TEM results and reveals a fast approach of statistical characterization of epitaxially grown nanowires, where, for instance, phase control of the growth process can easily be investigated with statistical relevance. In the second example, nanoplasmonic particles are characterized by TKD, where a correlation between individual particles microstructure and their hydride-formation pressure is presented, and the role of grain boundaries is revealed[4].

Considering that SEMs are more commonly accessible and relatively simpler to operate compared to a TEM, these examples clearly show that characterization of low dimensional material by TKD has a large prospective and can play an important role in many fields of functionalised low dimensional materials.

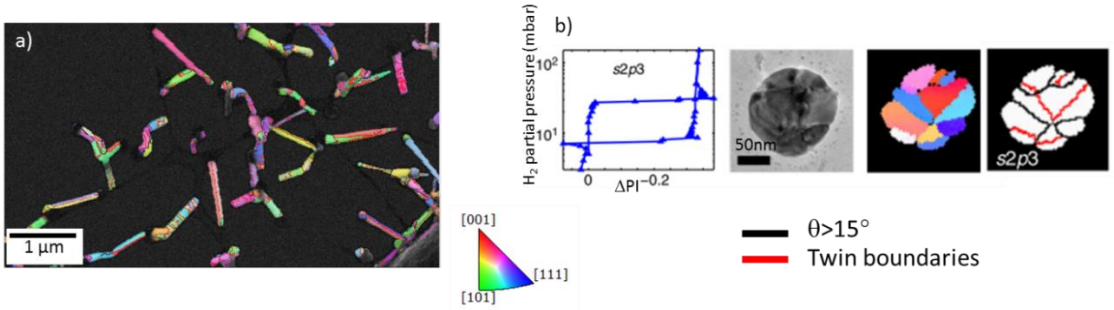

Figure 1: a) TKD orientation map of InP nanowires b) single particle isotherms with TEM and TKD micrographs[4].

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