A systematic comparison of on-axis and off-axis transmission Kikuchi diffraction

Abstract The capabilities of the novel on-axis transmission Kikuchi diffraction (TKD) technique were explored in a systematic comparison with conventional off-axis TKD. The effect of experimental parameters on the appearance of on-axis and off-axis Kikuchi patterns was measured and discussed. In contrast to off-axis TKD, on-axis TKD is more sensitive to changes in beam current and beam energy and less sensitive to changes in working distance and detector distance. Moreover, on-axis TKD has a distinct advantage over off-axis TKD due to enhanced pattern intensity, which allows reduction of the beam current or an increase in the acquisition rate. The physical and effective spatial resolution were measured with detector-typical parameters. Even though the spatial resolution of both configurations did not differ significantly under test conditions, on-axis TKD enables measurement over large areas with the determined resolution, whereas off-axis TKD is more sensitive to beam drift. Band detection by the Hough-transform led to indexing of, on average, one additional Kikuchi band when measuring with on-axis TKD compared to off-axis TKD and operated more stable on on-axis patterns.

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