White Beam Topography of 300 mm Si - Wafers

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White beam synchrotron topography (SXRT) is based on recording a Laue-pattern of reflections where each reflection contains a topograph from the same investigated crystal position. Up to now the patterns are collected on normal or high resolution X-ray films (Agfa D3sc, Slavich VRP-M). Each reflection corresponding to a different diffraction vector is magnified, photographed and digitalised with a conventional light microscope. The details about the TOPO-beamline and the experimental station at ANKA are given in ref. [1]. The beamline is now upgraded to handle 300 mm or even larger wafers.

In addition there is now a digital X-ray camera [2] available to image single reflections with excellent resolution and increased dynamic range. Every single reflection is collected via a $CdWO_4$ scintillating single-crystal (40 µm thick, polished on both sides and glued to a YAG substrate). Its luminescence image is projected and magnified onto a CCD camera (PCO4000, 11 MPixel, 13bit) via a microscope optic. Using this system, the achieved lateral resolution is approximately 5 µm.

The topographs collected on high resolution film and by digital camera show a comparable high resolution [3]. Fig 1 compares section topographs from nearly perfect Si showing sharp Pendellösung fringes. In this paper the advantages and disadvantages of the digital topography will be discussed for various defects in Si wafers and III-V-compound semiconductors with special attention paid to the increase of image spatial and dynamical resolutions as well as the reduction of exposure time.

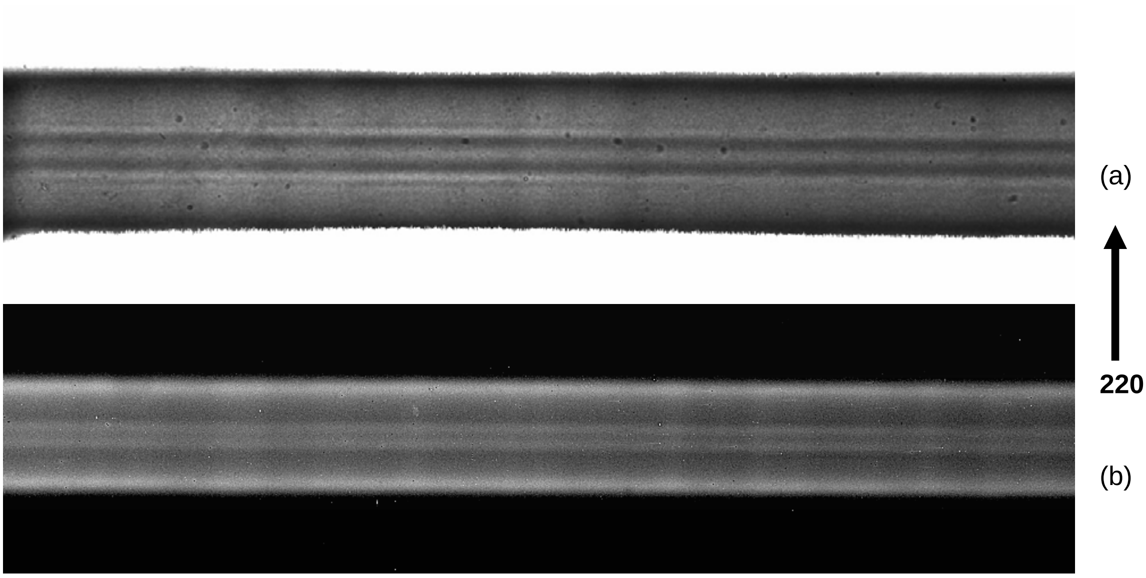

Fig. 1: Pendellösung fringes in perfect Si, 220 - reflection
(a) High resolution film SXRT20, distance 9 cm, 31 min (image processed)
(b) High resolution camera, distance 19 cm, 20 min (dark corrected, image processed)

[1] A. N. Danilewsky, R. Simon, A. Fauler, M. Fiederle and K. W. Benz, *Nuclear Instruments and Methods in Physics B* **199(1)** (2003), 7174.
[2] Weidemann G., Goebbels J., Wolk Th., Riesemeier, H.: First Computed Tomography Experiments at BAMline, *BESSY Annual Report 2001*, 249-250.
[3] A. N. Danilewsky, J. Wittge, A. Rack, T. Weitkamp, R. Simon, *Z. Krist. Suppl*. **25** (2007) .