s10.m32.p1 **Establishing Wafer Surface Defects Using Polycapillary Optics.** Likhoushina E.V., Kumakhov M.A., Ibraimov N.S., Nikitina S.V., Bolotokov A.A., Zvonkov A.D., Lyutsau A.V., Yudina M.V., *Institute for Roentgen Optics, Moscow, Russia*. *E-mail: kat@iroptic.ru*

Keywords: Pollycapillary optics; Single crystals

The method of determining the level of defects (mosaic pattern, density of dislocations etc) in Si single crystals for the purposes of wafer rejection in semiconductor industry is described. The method was developed on the basis of Kumakhov polycapillary optics both for parallel and convergent beams. Wafers with shear planes (111) and (001), the surface layers of which were distorted by grinding using diamond powders with different grain size, were analyzed. Quasi-parallel beams obtained through Kumakhov x-ray half-lenses featured divergence of ~ 12 ′; convergent beams formed focusing lenses featured the angle of convergence of 2.7°, the focal spot size being ~ 1mm2. For quasi-parallel beams, non-monochromatic Cu radiation was used under the conditions of Bragg-Brentano scheme of exposure. In this instance, drastic increase of integral intensity of the diffraction maximum was discovered in case of compliance of the units' off-orientation angle and x-ray beam divergence. This is followed by bigger maximum half-width. Similar picture was observed in case of kinematics-free exposure using polycapillary lens-based x-ray diffractometer/sorter. The above allowed to develop a method of sorting wafers in the course of their manufacture not only based on shear angle deviation but also based on distortion of their lattice.

s10.m32.p2 **New Possible Applications of Kumakhov Polycapillary Optics in X-ray Diffraction Microscopy (X-ray Topography).** Lyutsau A.V.[1], Lyutsau V.G.[2], Kumakhov M.A.[1], Ibraimov N.S.[1], Nikitina S.V.[1], Likhoushina E.V.[1], Zvonkov A.D.[1], Kotyolkin A.V.[1], [1]*Institute for Roentgen Optics, Moscow, Russia;* [2]*IMASH RAN, Moscow, Russia. E-mail: optics@yandex.ru*

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Modified Barrett method is discussed, wherein the Wadewitz scheme, instead of reference grid placed in the primary x-ray beam, uses multi-ray quasi-parallel x-ray beam formed by x-ray half-lens, featuring the angle of divergence equal to double total external reflection angle specific to the selected radiation and material of polycapillary half-lens. Polycapillary half-lens is positioned at the diffraction angle to the surface-forming crystallographic plane at such distance to single crystal, so that beams from neighboring capillaries do not cross and produce a shadow image of the regular structure of polycapillary half-lens on the surface of the investigated single crystal. It is possible to position polycapillary half-lens at a diffraction angle to other crystallographic planes as well. In case of "ideal" investigated single crystal, this image transfers undistorted onto the 2D detector of diffracted x-rays. In case of real single crystal, low-angled borders change regularity of the shadow image of the polycapillary half-lens structure. The level of such irregularity enables qualitative and quantitative assessment of imperfectness of both surface-forming and other crystallographic planes of a single crystal.