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PROPOSAL OF SYNCHROTRON BEAMLINE PLM6 "X-DAS"

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The X-DAS beamline should enable research experiments on very thin (also biological specimens) as well as "optically thick" (high *Z*) samples which are subject to investigation both in solid state physics and materials engineering. Intention of the proposal is an experimental line adapted to a wide- and a small-angle X-ray scattering techniques denoted as WASX and SAXS, respectively. Simultaneous registration of diffraction effects by the both techniques is practicable by means of suitable goniometers and detectors. This way the X-DAS beamline will provide an unique experimental setup for *in-situ* research of phase transition and precipitation effects.

Destination of the X-DAS beamline is mezo- and micro- scale characteristics of functionally graded and layered structures especially by means of advanced methods developed also at the home Institute, like the X-ray texture tomography (see Fig. 1), planar- and depth-configuration of residual stresses, phase composition and volume fraction in texturized materials, line profile analysis, and non-standard experiments using polarized synchrotron beam.

In the case of possible higher-energy photon beam (> 20 keV), the intended beamline will enable to realize the above mentioned characteristics for bulk materials and in real construction components.

Application field of the research problems undertaken (solved) by means of the X-DAS beamline covers such problems like:

- characterization of structure of advanced materials,
- diagnosing of structure degradation in exploitation conditions,
- improvement of efficiency of the solar cells developed and manufactured at the IMMS in Cracow,
- a new material research in the field of structure inheritance and interactions of metal/ceramic/polymers with human body tissue applied *e.g.* in construction of the Polish artificial heart.

Besides the above mentioned fields of investigation, the X-DAS beamline will be capable to serve as an experimental set-up for a widely-applied X-ray diffraction techniques demanding intensive and parallel photon beam.

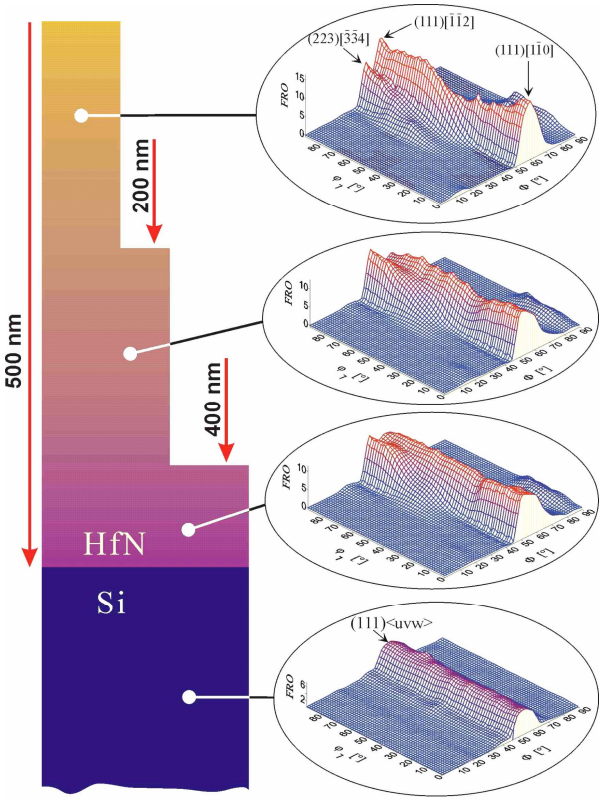

Figure 1. X-ray Texture Tomography reveals the depth-profile of the space arrangement of grains/crystals in HFN layer, about 500 nm thick, deposited on Si (111) crystal, presented in the form of ODF (Orientation Distribution Function) sections in the Euler angle space for $\varphi_2 = 45°$. The identified texture components for chosen tomographic layers of the thickness: 200 nm, 400 nm and 500 nm are indicated in the figure. Better space resolution of the tomography is possible using synchrotron beam only.