

XRD STUDIES OF NB/SAPPHIRE(001) THIN FILMS DEPOSITED WITH THE ULTRA-HIGH-VACUUM CATHODIC ARC TECHNIQUE

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Niobium films on the single crystal substrate have been studied. The films of thicknesses less than 5 nm, 5 nm, 15 nm and 400 nm were deposited onto sapphire (001) surface by mean of the cathodic arc in UHV conditions [1-3]. Energy of incoming Nb³⁺ ions in the range of tens electronvolts and substrate temperature about 200°C are distinctive characteristics of that deposition method. The aim of performed XRD studies was to recognize the structural forms of Nb film formed in the early stages of growth. The measurements were preformed at the wiggler beamline W1 using the photon energy 8048 eV corresponding to the wavelength $\lambda = 0.15406$ nm (Cu K_{α1} characteristic line).

According to our studies, the growth of Nb layer is realized in three stages: the first one is the growth of very

thin and preferably (110)-oriented layer. In the next stage an increasing of the layer thickness lead to the almost single crystal layer with (110) lattice planes parallel to the substrate surface. In the last stage, observed for the thickest layer, the appearance of thin polycrystalline Nb layer, probably on the surface, have been observed.

References

- [1] R. Nietubyc, J. Pelka, M.J. Sadowski, P. Strzyżewski, *AIP Conf. Proc.* **993** (2008) 415.
- [2] P. Strzyżewski, M.J. Sadowski, R. Nietubyc, K. Rogacki, W. Paszkowski, T. Paryjczak, J. Rogowski, *Mater. Sci.–Poland* **26** (2008) 213.
- [3] J. Langner, R. Mirowski, M.J. Sadowski, P. Strzyżewski, J. Witkowski, S.Tazzari, L. Catani, A. Cianchi, J. Lorkiewicz, R. Russo, *Vacuum* **80** (2006) 1288.

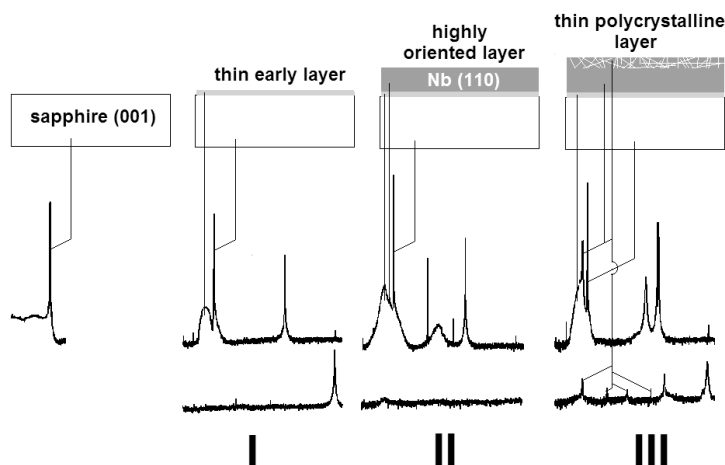


Figure 1. The growth of Nb film as seen with the x-ray eye.