

# **CHARACTERIZATION OF NANOMETER LAYERED STRUCTURES USING MULTIPLE WAVELENGTH X-RAY REFLECTIVITY AND SIMULATED ANNEALING DATA ANALYSIS**

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In the manufacturing of structures composed of multilayers with individual thickness in the nanometer range, a characterization problem arises due to the large number of parameters involved (3 parameters for each layer). To address this problem we have performed hard x-ray grazing incidence reflectivity, a non-destructive technique in which x-rays can penetrate through the whole structure. However, the amount of information present in the experimental data is often insufficient and strong correlation between parameters (e.g. thickness and density) may occur during data analysis. Measurements were performed at various wavelengths selected from the wide spectrum of a synchrotron x-ray source with the aim of circumventing this difficulty. Solving the structures under investigation, - a typical inverse problem -, is possible through a Markovian probabilistic optimization algorithm, known as simulated annealing. In the fitting procedure, a solution is searched for the ensemble of experimental data collected.

Results obtained for layered structures to be used as x-ray optical coatings will be presented to demonstrate the capabilities and present limitations of the method.