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Multilayer Optic Based Components for Synchrotron Sources

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In the last 20 years, multilayer optics for x-ray and EUV applications have revolutionized the measurement capabilities and the experimental set ups of synchrotron beamlines. Rigaku Innovative Technologies (formerly Osmic) has pioneered these technologies by designing, engineering and manufacturing of distinctive multilayer coatings. We are experienced and internationally recognized for our innovative technologies. We control our production of specified internal roughness on the atomic level while creating layered materials of defined thickness. These multilayers have d-spacings, synonymous for layer-pair thickness, which we can produce uniform, laterally graded, depth graded or even a combination of both gradients. We guarantee our specifications and we have a wide range of metrology technology in house, enabling us to keep our promised specifications and to expand the technical boundaries in our field of applications.

Our core capabilities are the detailed knowledge of distinctive multilayer coating technology including the mounting and alignment of optics. We do direct coating on prefigured substrates or, mostly for applications in analytical laboratories, bonding of thin substrates to flat or curved backings. Having delivered thousands of multilayer structures to the analytical scientific market, we are able to design and engineer multilayers on the basis of numerical and analytical simulations of thickness, roughness, required densities and other optical parameters.

This technology gives us the possibility to produce - just as one example - multilayers with a period of 15 Angstroms, a reflectivity of much better than 30% and an energy resolution of better than 0.4%. We also have coatings and multilayer structures for substrates up to 1400 mm length and 400 mm width. The number of chemically different coatings we are able to perform is very broad. This is starting with the classical W/Si through Mo/B_4C to a lot of other material combinations.

We also design and produce dual wavelength multilayers, narrow- and broad-bandwidth multilayers for energy ranges from 40ev to 40 keV. Please see figure (1) for further details. Here we have shown our calculated values for two different multilayer sandwiches. Further material will be shown. Our actual production quality will also be presented.

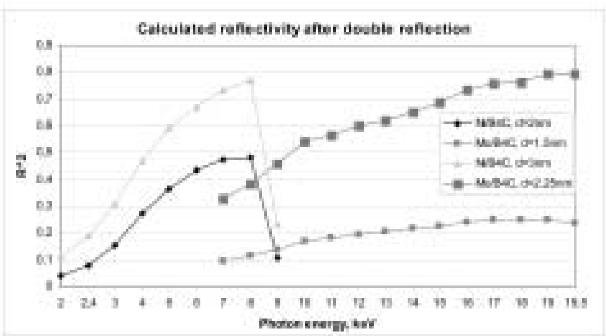

Figure (1): Reflectivity after double reflection with different multilayer periods and at different energies.

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X-ray diffraction and Raman spectroscopy studies of high-pressure polymorphs of L- and DL-serine

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The response of crystal structures of L-serine and DL-serine to an increase in hydrostatic pressure was shown to be radically different: reversible phase transitions were observed in L-serine at 5.3 GPa (reverse transition at 4.0 GPa) and 7.8 GPa, whereas the crystal of DL-serine was stable at high pressures up to 8 GPa. Structural distortion and phase transitions were followed by Raman spectroscopy, X-ray single-crystal X-ray diffraction (a laboratory radiation source), high-resolution X-ray diffraction (synchrotron radiation). The structures of the two high-pressure phases were solved and refined from single-crystal and high-resolution powder diffraction data; the results were in a good agreement. The anisotropy of strain within the range of stability of the same phases was compared for L- and DL-serine. Pressure-induced changes were radically different from those on cooling. Phase transitions in single crystals of L-serine were shown to proceed in a single-crystal-to-single-crystal mode, via a rapid propagation of an interface after a pronounced induction period. In powder samples, the two phases - a low-pressure and a high pressure phase - co-exist from about 5 up to 10 GPa, and this shows, that the phase transitions in the powder samples are to a large extent kinetically controlled.

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