with the necessary sensitivity using conventional methods. By energy dispersive diffraction we have been able to determine preferred orientation parameters in thin palladium films grown in (111) orientation and co-deposited with rare gases.

Structure analysis as a function of depth in thin films and surface layers is an exceptionally important problem in various technologies. X-ray penetration can be limited by glancing incidence to a few tens of Angström units while the high intensity still allows 2θ-scans to be made in a reasonable time. Control of fluorescence and signal-to-background is important and it is achieved by a suitable choice of wavelength. Quantitative measurements of composition against depth have been made in thin layers of material in the Fe_3O_4 - Fe_2O_3 system.

15.X-4 ULTRA SAS WITH POINT FOCUSING GEOMETRY USING SYNCHROTRON RADIATION.

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Most high resolution small angle scattering cameras employ the so-called infinite slit height geometry, i.e. the measured pattern does not directly represent the original 2D-scattering pattern of a given sample but only a vertically integrated modification of it. In order to retrieve the richer information contained in the 2D-pattern more or less labourious and occasionally quite dubious desmearing procedures have to be applied to the measured data. Such methods fail in particular when the sample and hence also the original scattering pattern is lacking rotational symmetry about the incident beam. However, as will be shown here, a SAS camera featuring point geometry, momentum resolution at the level of 10^{-5} reciprocal angstroms and, at the same time, reasonable intensity can be realized by combining outstanding properties of SR, namely its excellent collimation and high brightness, with the use of multiply reflecting groove crystals in two diffraction planes at right angle to each other (Bonse and Hart, ZS Physik 189 (1965),151). Because SR is already sufficiently collimated in the horizontal plane, no groove crystal diffracting in that plane is needed in front of the sample, which is in contrast to the situation encountered at the conventional x-ray tube where crystals diffracting in either plane are necessary behind and before the specimen. First results obtained with test samples will be presented.

15.X-5 BRAGG REFLECTION X-RAY OPTICS FOR SYNCHROTRON RADIATION SOURCES.

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Bragg reflecting perfect crystals are well matched to the characteristics of present day synchrotron radiation sources. By comparison with advances foreseen in the development of insertion devices to produce very high brightness sources on the next generation of storage rings, consideration of the next generation of x-ray optical beamlines is still at the prehistoric stage. There is an international obsession with the problems caused by beam-heating which, while important, is secondary to the problems which arise in x-ray optical design. For many situations, where the high source brightness must be delivered at the specimen position with good signal-to-background, almost no suitable x-ray optical systems exist even as coneceptual designs.

During recent years perfect silicon crystals and the appropriate dynamical diffraction theory have been exploited in the invention of almost all of the necessary x-ray optical components. Thus, background free monochromators and collimators for spectroscopy and small angle scattering, harmonic-free spectrometers, tunable polarizers and analysers, quarter wave plates, variable resolution crystals spectrometers, phase and amplitude modulators and x-ray interferometers have all been demonstrated. Of these only low-harmonic spectrometers have so far been implemented on a routine basis. Other x-ray optical systems have been used by specialist groups; some results will be reviewed.

15.1-1 MICROCRYSTAL DIFFRACTION TECHNIQUES.

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Exploitation of the brightness of synchrotron X-radiation in diffraction experiments on microcrystals in the 1-15μm size range has required the development of techniques additional to those employed in conventional single-crystal X-ray diffraction. Workable methods for microcrystal selection and mounting, diffractometer alignment, background reduction, microcrystal orientation matrix definition and optimization, and intensity data collection and reduction are described. These techniques enable near-routine collection of intensity data sets from microcrystals $\geq 5\mu$m, and perhaps smaller. Data for a selection of materials with known structures have been collected on beamline X10A at the National Synchrotron Light Source, Brookhaven. Results are summarized and considerations associated with analyses of unknown structures are also addressed.