faces the spectrophotometer's beam; this result can be explained by total internal reflection effects and the different roughness scales of the film's two surfaces. Preliminary results on the polishing of several FACVD films using a heated steel disk, a rhenium filament and a hydrogen environment are discussed. An Auger depth profile of the steel disk shows graphite at the surface of the disk, iron carbide in the bulk, and a depletion of carbon in the bulk near the surface. The films' surface roughness before and after polishing was measured with a profilometer, and local roughness averages of less than 500 Å have been achieved. Results of optical scatter measurements made on films before and after polishing are presented. 15 Refs. Index Terms: Diamonds - thin films; Films - synthesis; Polishing; Optical properties; Surfaces - roughness measurement; Polycrystalline diamond films; FACVD films; Surface roughness; Optical analysis.

27, T. D. Doiron, **"High Precision Gaging with Computer Vision Systems. Final Report,"** *Industrial Metrology*, 1 pp. 43-54. (1990). In order to use a computer vision system for high accuracy gaging, the intensity array reported to the computer from the camera must correspond closely to the geometry of the part to be measured. To verify this correspondence for two different vision systems, a number of tests are reported and discussed. A number of effects due to the camera sensor geometry, the type of edge finder employed, the thermal properties of the camera, and the interface method used between the camera and computer are explored. Index Terms: Computer vision; Edge detection; Video equipment; Interfaces; Cameras; Precision; Accuracy; Gaging; Robot vision.

28, J. K. Myler, R. A. Parker, A. B. Harrison, **"High quality diamond turning,"** *Advanced Optical Manufacturing and Testing*, Vol 1333, pp. 58-79. Int Soc for Optical Engineering, Bellingham, WA. Commercially available diamond turning machines offer high levels of accuracy where the full potential of the machine is realized. This is achieved by in-process measurement and test, which monitor the key areas of possible degradation of accuracy in surface form and texture. This paper identifies the most significant of these, and describes practical methods for monitoring and control of the process. New techniques such as an interferometer for rapid diamond tool positioning and centering are highlighted along with the properties of tool wear. Results on some typical diamond machines IR components are presented. 7 Refs. Index Terms: Optical devices - manufacture; Cutting tools - diamond; Grinding wheels - diamond; Optical variables measurement; Machine tools; Diamond turning machines; Diamond cutting.

29, G. Richter, **"High speed oscillation free lapping and polishing process for optical lenses,"** *Optical Fabrication and Testing*, Vol 1400, pp. 158-163. Int Soc for Optical Engineering, Bellingham, WA. LOH created a method of oscillation free lapping and polishing of optical lenses which led to a considerable increase of quality. This method, named 'SYNCHROSPEED', consists of computer calculations for tools and machine set up data, new designed tools and work-piece-holders and also specially developed machines. These facts enable the user to achieve a high repeatability even for difficult lenses. Last not least the set-up and production times were drastically reduced. Index Terms: Lenses - polishing; Polishing - applications; Computer software - applications; Machine tools - computer applications; Software package 'SYNCHROSPEED'; Workpiece holders.

30, R. I. Grosvenor, C. Kharpoutly, K. F. Martin, **"In-process measurement problems in machine tool applications,"** *International Journal of Production Research*, 29(2), pp. 357-374. (Feb 1991). Sensor-based machine tool management systems will provide many, well documented benefits in the use of modern machine tools. A vital element will be the provision of sensing methods able to measure in-process, that is whilst machining is taking place, within machine tool environments. This paper describes the background to, and development of a 'bottom up' approach to tackling this sensing requirement. Simple, commercially available proximity sensing devices are used, the aim being to make them work reliably and accurately in a machine tool environment. The problems of coolant, heat, chips, vibrations, workpiece deflections and sensor calibration are systematically investigated and ranked in order of severity. A discussion of the use of single sensors, with novel techniques, or multiple sensors is included. These may be used to overcome the major problem of workpiece deflections under cutting forces. 16 Refs. Index Terms: Machine tools; Sensors - applications; Measurement errors; Cutting tools - control; In process measurement problems; Workpiece deflections.

31, Y. Shen, G. P. Ruthven, G. Shen, **"In-process mirror figure qualification procedure for large deformable mirrors,"** *Advanced Optical Manufacturing and Testing*, Vol 1333, pp. 337-346. Int Soc for Optical Engineering, Bellingham, WA. One of the unique properties of deformable mirrors is their ability to be shaped. The as-assembled mirror figure can vary greatly, depending on the adjustment capability of the actuators used to shape it. Due to these variations, it is difficult to directly interpret progress during the mirror-polishing cycle when the interpretation is based only upon the metrology interferometric readings. An in-process figure qualification procedure, which has been developed at Hughes Danbury Optical Systems, is described in this paper. By facilitating the real time monitoring of progress, the application of this procedure will accelerate the fabrication of large deformable mirrors. 1 Ref. Index Terms: Mirrors - polishing; Interferometry; Actuators; Optical variables measurement; Mirror figure; Deformable mirrors; Large mirrors.

32, D. K. Bowen, **"Instrument calibration for nanotechnology,"** *Measurement and Control*, 24(2), pp. 47-51. (March 1991). The problem of instrument calibration for nanotechnology applications is discussed, with particular reference to the establishment of standards based upon easily reproduced natural parameters such as the lattice spacing of a homogeneous crystal. The successful application of X-ray interferometry using silicon crystals to the measurement of displacement down to five picometres is discussed, and further possibilities for its use in instrument calibration in the nanotechnology regime are considered. Index Terms: Calibration; Crystal atomic structure of elements; Displacement measurement; Electromagnetic wave interferometry; Lattice constants; Measurement standards; Silicon; Spatial variables measurement; X-ray applications; X-ray optics; Measurement standards; Nanotechnology; Instrument calibration; Lattice spacing; Homogeneous crystal; X-ray interferometry; Silicon crystals.

33, V. N. Chizhov, I. M. Petrovskaya, Y. P. Trykov, A. E. Volkov, **"Instrument for measuring the radius of round-off of the cutting edges of cutting tools and hard alloy plates,"** *Measurement Techniques*, 33(6), pp. 560-562. (June 1990). A hard alloy tool with optimum value of the round-off radius of its cutting edges possesses maximum reliability and durability. The shadow profile principle which is used for measuring the round-off radius is described. The principle is characterized by the