

A new, automated solution provides a much higher level of production quality control for cylinder bore finish. The BICER1 Optical Bore Scanner works by directing the beam of an eye-safe (0.5mW) Helium Neon laser on to the bore surface. The reflected light is detected by a signal photo diode and, as its intensity is dependent on surface finish, the ratio between this and a reference reading provides data from which areas of poor surface finish can be identified.

60529 Anon

Probability of detection of defects in coatings with electronic shearography

National Aeronautics and Space Administration, Huntsville, Alabama (United States), N95-29734/2/GAR, 22pp. (Jun. 1995)

The goal of this research was to utilize statistical methods to evaluate the probability of detection (POD) of defects in coatings using electronic shearography. The coating system utilized in the POD studies was to be the paint system currently utilized on the external casings of the NASA space transportation system reusable solid rocket motor boosters. The population of samples was to be large enough to determine the minimum defect size for 90-percent POD of 95-percent confidence POD on these coatings. Also the best methods to excite coatings on aerospace components to induce deformations for measurement by electronic shearography were to be determined.

60524 Beard, P.C.; Mills, T.N.

Extrinsic optical-fiber ultrasound sensor using a thin polymer film as a low-finesse Fabry-Perot interferometer

Applied Optics, Vol. 35, No. 4, pp. 663-675 (1996)

Theoretical and experimental aspects of an extrinsic optical-fiber ultrasound sensor are described. The sensor is based on a thin transparent polymer film acting as a low-finesse Fabry-Perot cavity that is mounted at the end of multimode optical fiber. Performance was found to be comparable with that of a piezoelectric polyvinylidene difluoride-membrane (PVDF) hydrophone with a sensitivity of 61 mV/MPa, an acoustic noise floor of 2.3 KPa over a 25-MHz bandwidth, and a frequency response to 25 MHz. The wideband-sensitive response and design flexibility of the concept suggests that it may find application as an alternative to piezoelectric devices for the detection and measurement of ultrasound.

60330 Powell, G.R.; Crosby, P.A.; Fernando, G.F.; France, C.M.; Spooner, R.C.; Waters, D.N.

In-situ cure monitoring of advanced fibre reinforced composites

Smart Structures and Materials 1995: Smart Sensing Processing and Instrumentation, San Diego, California (United States), 27 Feb. - 1 Mar. 1995. pp. 386-395. Edited by W.B. Spillman. SPIE Vol. 2444 (1995)

This paper describes a comparative study of in-situ cure monitoring and cure modelling by three methods: (a) evanescent wave spectroscopy, (b) refractive index change, (c) near-infrared spectroscopy. Optical fibres were embedded into aerospace epoxy resins during the manufacturing process of the composite. The cure characteristics were then tracked in real-time during the processing of the material via evanescent wave interaction. Results obtained from the optical fibre sensors were used to model the curing behaviour of the resin system. The results were compared with near-infrared spectroscopy and differential scanning calorimetry experiments carried out under similar conditions. The feasibility of utilising refractive index changes to monitor the extent of cure has also been demonstrated.

59924 Borghesi, A.; Sassella, A.; Abe, T.

Highly sensitive optical method for the characterization of SiO₂ films in bonded wafers

Japanese Journal of Applied Physics, Pt. 1, Vol. 34, No. 10B, pp. L1409-L1411 (15 Oct. 1995)

The thickness of very thin films (1-10 nanometers thick) and the frequency of the longitudinal optical mode of the material composing the film (related to its chemical and structural properties) are demonstrated to be measurable with high sensitivity by means of infrared transmission. The particular optical configuration proposed permits the analysis of the SiO₂ film in bonded wafers. It is shown that the sensitivity of this new method increases as the films are made thinner.

59729 Medvedev, M.N.; Melnikova, E.N.

A luminescence method of revealing oxide films on the surfaces of metal articles

Russian Journal of Nondestructive Testing, Vol. 30, No. 11, pp. 884-886 (Nov. 1994)

A method of revealing oxide films on the surfaces of metal and alloy articles using a plastic scintillator as a luminescence material with a red luminescence spectrum is investigated.

59712 Asai, Y.; Ozaki, Y.; Kubota, H.; Matsumoto, M.; Kanamori, H.

Psychophysical RMS granularity for the evaluation of radiographic mottle

Journal of Photographic Science, Vol. 43, No. 3, pp. 103-107 (1995)

The psychophysical RMS (root mean square) granularity sigma(p) is proposed for the evaluation of radiographic mottle, i.e., the granularity appearing in a radiograph made with an X-ray screen-film system. The value of sigma(p) is calculated from the Wiener spectrum of the radiographic mottle and the frequency dependence of the minimum perceptible contrast which expresses a psychophysical property of human vision. Examples are presented for three typical X-ray films. The density dependence of sigma(p) is in close agreement with the results of subjective rating that (1) the most perceptible density is 1.0 and (2) the perceptibility at density 2.5 is much worse than that at 0.6. Whereas the Selwyn granularity coefficient, which relates to the physical RMS granularity, does not correlate with the results of subjective rating.

59711 Matsumoto, M.; Ozaki, Y.; Kubota, H.; Asai, Y.; Kanamori, H.

Equivalent spatial frequency and optimum film densities for the perceptibility of radiographic contrast of step-edge images

Journal of Photographic Science, Vol. 43, No. 3, pp. 99-102 (1995)

Previous experimental results for minimum perceptible contrasts of step-edge images and sinusoidal periodic patterns were transformed to minimum perceptible luminous-exitance differences. By comparing the differences between the two kinds of patterns, the equivalent spatial frequency for the perceptibility of step edges was determined as 1.6 similar to 1.8 mm⁻¹. From the minimum perceptible contrasts of step-edge images, the optimum film densities for step edges were obtained as 1.1 similar to 1.3 for Kodak XRP mid OG medial films and 1.7 similar to 2.0 for Fuji Industrial 100 and FR industrial films.

59485 Ghaffari, K.; Wang, B.; Danyluk, S.

Measurement determination of in-plane residual stresses in thin silicon oxide films of different thicknesses by shadow Moire interferometry

ASNT 1994 Fall Conference and Quality Testing Show, Atlanta Georgia (United States), 19-23 Sep. 1994. pp. 77-78. ASNT (1994) ISBN 1-57117-002-2

The residual stresses in RF sputtered silicon oxide films of 50, 100 and 200 nm grown on 100 mm diameter (100) p-type silicon wafers were obtained by Shadow Moire interferometry. The residual stresses were deduced from out-of-plane deflection (strain) measurement of the wafers due to a centrosymmetric load of known value. The out-of-plane deflection for the entire surface of the 100 mm wafers was measured by Shadow Moire interferometric setup. Strain was measured from interferograms that were digitized using a frame grabber and image processing software. The fringe position and spacing was then transferred to a spread sheet and the 3D maps of the residual stresses were obtained.

59478 Habib, K.

Nondestructive evaluation of an epoxy-based coating by optical interferometry techniques

Optics and Lasers in Engineering, Vol. 23, No. 4, pp. 213-219 (1995)

A study on evaluating an epoxy-based coating was conducted. The study aimed to determine the performance of the coating on a low carbon steel as a result of chemical contaminations. Coated samples were tested in a local tap water by using the method of real time-holographic interferometry. A mathematical model was used along with the obtained experimental data.

59471 Weiss, P.; Sigrist, M.W.

Broadband fiber optic interferometer as ultrasonic transducer suitable for coating adhesion measurements

Review of Scientific Instruments, Vol. 66, No. 8, pp. 4114-4123 (Aug. 1995)

Our technique is based on laser-induced spallation of the coatings under test, combined with an interferometric monitoring of the spallation process which is manifested in the time dependence of the surface displacement of the coating. A fiber-optic interferometer has been developed, which features a low noise level of 1 nm and a large bandwidth of 300 MHz necessary for recording the fast transient surface displacements of the sample surface.