◆ ABSTRACTS OF TECHNICAL PAPERS ◇

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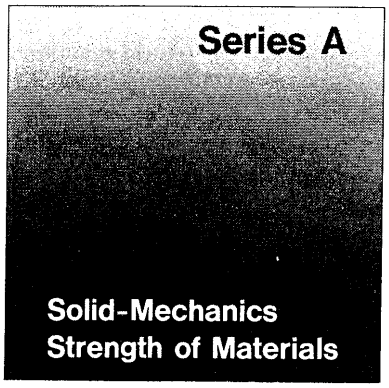

The Shrinkage Behavior of Unidirectional Fiber Reinforced Plastics in the Hardening Process

by Masahiro FUNABASHI and Kozo IKEGAMI*** This paper presents the shrinkage behavior of unidirectionally reinforced plastics with glass fibers or carbon fibers in the hardening process. The matrix material is vinyl ester resin. The strains of fibers in the reinforced plastics during the hardening process were measured by strain gauges bonded on the surface. The shrinkage amounts in the hardening process were estimated by the apparent change of the density. The hardening model of the fiber reinforced plastics was proposed, including the constraint effect of hardening the resin. The shrinkage strains calculated with the model were compared with the experimental results.

*Research Institute for Polymers and Textiles 1-1-4 Higashi, Yatabe, Tsukuba-gun, Ibaraki, 305, Japan

**Tokyo Institute of Technology, 4259 Nagatsuta, Midori-ku, Yokohama, 227, Japan

Spinal Shape Analysis by Bi-Plane X-Ray Photogrammetry (3rd Report, Accuracy of Vertebral Configuration Analysis)

by Tamotsu TAMAKI, Eisaku UMEZAKI*, Hidetaka KUBOTA*, Shun-ichi INOUE**, Kazuhisa TAKAHASHI**, and Masaya MIMURA*** According to the development of treatment of spinal deformity, information of the accurate three dimensional configuration of vertebra is needed. The accuracy of the measured locations and rotational angles by the developed photogrammetric system is studied. Errors are classified into three factors: The first is on the accuracy of the three dimensional reconstruction of location from two X-ray films. It is defined by the reference frame, calibration markers and reading of the landmarks using a digitizer. The second is on the calculating accuracy of a personal computer. This affects especially the calculated result of rotational angles. The third is on the identification accuracy of bony landmarks. They are recognized not as the point but as the region where the bone density is higher than the adjacent portion. The results show that the overall accuracies of the system are 1.5 mm on the location of the vertebral center, and 4° on the rotational angles of the vertebra.

*Department of Mechanical Engineering, Nippon Inst. of Tech., Gakuendai, Miyashiro, Minamisaitama, Saitama, 345, Japan

**Department of Orthop. Surg., School of Med., Chiba University, 1-8-1 Inohana, Chiba, 280, Japan

Fatigue Crack Growth Retardation Due to Compressive Overloads

by Yasufumi IMAI and Tomokazu MATAKE*** Fatigue crack growth retardation and complete arresting were experimentally observed in the CT specimens of grade A ship steel after compressive overloads were applied on the upper and lower sides of the ligament instead of loading at the pin positions. The degree of retardation depended on the magnitude of the compression and the crack arrested immediately after the compressive overload, $K_{OL}/\Delta K_{base} < -2$ ($\sigma_c < -100$ MPa), contrasting to the tensile overload case, $K_{OL}/\Delta K_{base} > 3$, where the crack arrested after growing by a small amount. The current crack closure model admits of compressive yielding near the crack tip even when the load is suppressed. Additional compressive loads, hence, proceed to the compressive yielding and increase the compressive yield strength there, which causes the slower crack growth associated with less reversed plastic zone size ahead of the crack. Compressive prestrain also raised the compressive yield strength in the material: slower growth rates, about 1/5 of the original rates were measured on the pre-strained specimen for −485 MPa.

*Department Mechnical Engineering, Nagasaki University, 1-14 Bunkyo, Nagasaki, 852, Japan

**Kitakyushu Technical College, 140 Shii, Kokuraminami-ku, Kitakyushu, 803, Japan

A Study on the Prediction of a Fatigue Crack Growth Path (Ist Report, A Preliminary Study)

by Satoshi FUJIWARA, Takashi MIYAZONO** and Shuuichi FUKUDA*** For the prevention of fatigue fracture, the prediction of the fatigue crack growth path is an important item. This paper deals with a fundamental study of this problem. Fatigue crack growth tests were carried out on SM 41 steel compact tention type specimens having drilled hole and the influence of hole location upon the crack growth path is investigated. The method of solution is based upon an application of Murakami's method, a convenience method for stress intensity factor solution by the finite element method. Solution results depend on mesh size that is crack growth size per one stage. The prediction of the fatigue crack growth path by a numerical approach using the finite element method agreed comparatively well with the experimental data.

*Tsuyama Technical College, 624-1 Numa, Tsuyama, 708, Japan

**Osaka University.