Abstracts of Papers by Bell System Authors Published in Other Journals

CHEMISTRY

Block Copolymer Theory—IV. Narrow Interphase Approximation. E. Helfand and Z. R. Wasserman, Macromolecules, *9* (November–December 1976), pp. 879–888.   A theory of microdomain structure in block copolymers, developed earlier, is simplified by approximations appropriate when the interphase width is narrow compared to the domain size. The free energy, written as an algebraic function, is minimized to obtain predictions of domain sizes. These are compared with experiments.

Gas Phase EPR Linewidths and Intermolecular Potentials V. Quantal Derivation. G. J. Fisanick-Englot and T. A. Miller, J. Chem. Phys., *66* (February 1, 1977), pp. 1175–1182.   A fully quantal derivation of the isolated line-broadening parameters applicable to gas phase EPR experiments is presented. Errors inherent in the use of zero field operators are discussed.

HCN from the Reduction of NO over Platinum, Palladium, Ruthenium, Monel and Perovskite Catalysts. R. J. H. Voorhoeve, C. K. N. Patel, L. E. Trimble, R. J. Kerl, and P. K. Gallagher, J. Catal., *45* (1976), pp. 297–304.   HCN was produced in mixtures of NO, CO, and H_2 at temperatures from 400–800°C. Most active in HCN production was a supported Pt catalyst, followed by Pd, Cu-Ni and Ru, in that order. Perovskite $La_{0.8}K_{0.2}MnO_3$ yields little HCN, but over $La_{0.8}K_{0.2}Mn_{0.94}Ru_{0.06}O_3$ the yield is higher than over either Ru or the matrix perovskite.

Oxidative Stability of Expanded Polyethylene for Wire and Cable. F. R. Wight, J. Cell. Plast. *12*, No. 6 (November/December 1976), pp. 317–319.   Decomposition of azodicarbonamide blowing agent in high density polyethylene has been reported to have an adverse effect on the oxidative stability of the material. The decomposition process itself has been implicated as being responsible rather than cell structure or residues. Data presented here clearly show that at 195°C and only in the presence of copper, blowing agent residues reduce the oxidative stability of high density polyethylene. Furthermore, data produced at 120°C show that neither the decomposition process nor the residues have any effect on oxidative stability at this temperature. Rather, it is argued that any decrease in oxidative stability at 120°C or lower is due to the cell structure which alters the diffusional properties of the finished insulation.

Singlet-Triplet Anticrossings in ^{4}He. III. Separation and Mixing of the n = 3 − 8 ^{1}D and ^{3}D States. J. Derouard, R. Jost, M. Lombardi, T. A. Miller, and R. S. Freund, Phys. Rev. A, *14* (1976), pp. 1025–1035.   Measurements of both the zero-field singlet-triplet separation and the antisymmetric part of the spin-orbit coupling between singlet and triplet D states of He with n = 3 − 8 are presented.

Theory of the Concentrated Polymer Solution/Solvent Interface. E. Helfand A. M. Sapse.* J. Polym. Sci. C, Flory Symposium, *54* (1976), pp. 289–297.   A theory is presented of the interface between a solvent and a saturated polymer solution. Random-walk statistics are assumed for the macromolecules. Results are presented for a general and a Flory-Huggins form of the free energy. There is good correspondence with a recently developed lattice theory of these systems.   *City University of New York.

Tropospheric Halocarbons: Estimates of Atmospheric Chemical Production. T. E. Graedel and D. L. Allara, Atmos. Environ., *10* (1976), pp. 385–388.   Selected thermal and photochemical atmospheric reactions have been evaluated as potential sources for the family of halocarbons recently detected in tropospheric air. Formation of CH_3Cl is extremely slow and that of CCl_4, $CHCl_3$, CH_3I, CH_3CCl_3 and the chlorinated ethylenes

is negligible, implying that direct emission is responsible for the presence of these compounds.

ELECTRONIC AND ELECTRICAL ENGINEERING

Frequency-Agile Millimeter-Wave Phase Lock System. P. S. Henry, Rev. Sci. Instrum. *47* (September 1976), pp. 1020–1025.   A frequency-agile phase lock system for millimeter-wave klystrons is described. The system locks the klystron to a crystal-controlled reference signal derived from a frequency synthesizer. By programming the synthesizer, the klystron can be stepped through any sequence of frequencies lying within a band roughly 200 MHz wide.

Optical-Fiber Impulse-Response Measurement System. J. W. Dannwolf, S. Gottfried, G. A. Sargent, R. C. Strum, IEEE Trans. Instrum. Meas., *IM-25*, V. 4 (December 1976), pp. 401–406.   This paper describes time-domain instrumentation designed to measure impulse response and delay of multimode optical fibers used in an experimental optical communications system at Bell Laboratories. Time-domain data is transformed to frequency-domain by a minicomputer, and the result is displayed as the fiber's baseband frequency response.

Tantalum Thin Film RC Circuit Technology for a Universal Active Filter. W. Worobey and J. Rutkiewicz, IEEE Trans. Parts, Hybrids and Packag., *PHP-12*, No. 4 (December 1976), pp. 276–282.   This paper describes the physical layout, process sequence, and component properties of an RC universal active filter. The high-precision filter is fabricated on a 16-pin dual in-line package ceramic substrate using tantalum thin film technology. It is comprised of 300 $\Omega/\square$ resistors, 190 V anodized tantalum capacitors, and an operational amplifier.

The Use of Echo Time-Weighting to Derive Oscilloscope Graticules for Rating Television Transmission Performance. R. W. Edmonds, SMPTE J., *85*, No. 6 (June 1976), pp. 393–396.   This paper describes a method for designing oscilloscope graticules for measuring the short-time waveform performance of broadcast television systems. The design is based on recently obtained single-echo time-weighting functions for monochrome and color signals.

Using Triangularly Weighted Interpolation to Get 13-Bit PCM from a Sigma-Delta Modulator. J. C. Candy, Y. C. Ching, and D. S. Alexander, IEEE Trans. Commun., *24*, No. 11 (November 1976), pp. 1268–1275.   Accumulating a weighted sum of sigma-delta codes generates a high-resolution PCM signal. Several weighting methods are evaluated with regard to resolution and spectral response; a triangular weighing is near optimum. Implementation of a 13-bit PCM encoder is described and a method for overcoming a threshold phenomenon is presented.

MATERIALS SCIENCE

Electrical, Structural and Optical Properties of Amorphous Carbon. J. J. Hauser, J. Noncrystal. Solids, *23* (January 1977), pp. 21–41.   The planar and transverse electrical resistivity of amorphous carbon (a-C) films is well fitted by the expression $\rho = \rho_0 \exp (T_0/T)^{1/4}$. Films thinner than 600 Å display a two-dimensional hopping conductivity from which one deduces a density of states $N(E_F)$ at the Fermi level of $10^{18} \mathrm{eV}^{-1}\mathrm{cm}^{-3}$ and a radius of the localized wave functions (a) of 12 Å.

Epitaxial Structures with Alternate-Atomic-Layer Composition Modulation. A. C. Gossard, P. M. Petroff, W. Weigmann, R. Dingle, and A. Savage, Appl. Phys. Lett., *29*, No. 6 (15 September 1976), pp. 323–325.   Epitaxial structures grown by alternate monolayer depositions of GaAs and AlAs are reported. As many as 10^4 alternate (100) layers of GaAs and AlAs as thin as 1.0 ± 0.1 and 1.0 ± 0.1 monolayers, respectively, were deposited and studied by transmission electron microscopy and optical techniques.

The Optical Properties of a Soda-Lime-Silica Glass in the Region From 0.006 to 22 eV. B. G. Bagley, E. M. Vogel, W. G. French and G. A. Pasteur, J. N. Gan, and J. Tauc,* J. Non-Crystalline Sol, *22* (November/December 1976), pp. 423–436.   From the measured absorption and reflection spectra, we have determined the optical properties of a well-characterized (with respect to impurities and homogeneity) high-purity 21.3 wt% Na_2O—5.2 wt% CaO—73.5 wt% SiO_2 glass over the energy range 0.006—22 eV. The origins of the absorption spectra are discussed.   *Brown University.

PHYSICS

Dynamic Central Peaks in a Crystalline Solid: $KTaO_3$. K. B. Lyons and P. A. Fleury, Phys. Rev. Lett., *37*, (July 19, 1976), pp. 161–164.   We report two central peaks in the quasielastic-light-scattering spectrum of $KTaO_3$. The polarization and angular dependence of the linewidth indicate that the narrow component (2.3 ± 0.3 GHz at 300 K in right-angle scattering) is due to entropy fluctuations. A tentative identification of the broader component with two-phonon processes is made.

Two-Dimensional Cochlea Fluid Model—New Results. J. B. Allen, JASA, *61*, No. 1 (January 1977), pp. 110–119.   With the recent availability of the physical measurements of Rhode [JASA, *49* (1971), pp. 1218] many theoretical models have proven to be incomplete or inadequate. In this paper, solution of the two-dimensional model of Lesser and Berkley [J. Fl. Mech., *1* (Jan. 1970)] are shown to be in close agreement with the results of Rhode.

Growth and Continuous Compositional Grading of Ga(As,Sb,P) by Liquid Phase Epitaxy. R. E. Nahory, M. A. Pollack, and J. C. DeWinter, J. Appl. Phys., *48*, No. 1 (January 1977), pp. 320–323.   Liquid phase epitaxial growth of Ga(As,Sb,P) is described. Layers have been continuously graded from a composition with the lattice constant of GaAs to a composition suitable for subsequent growth of a GaAsSb double heterostructure laser. The details of the grading are discussed in terms of a phase diagram calculation.

SYSTEMS ENGINEERING AND OPERATIONAL RESEARCH

Application of New Ridge Regression Methods to a Study of Bell System Scale Economies. H. D. Vinod, JASA, *71* (December 1976), pp. 835–841.   We suggest a new horizontal scaling for the "ridge trace," some new techniques for monitoring ridge solutions including an index of stability of relative magnitudes (ISRM) and numerical largeness of more significant (NLMS) regression coefficients. A method of curtailing the tending of ridge regression coefficients toward zero is also presented. Two examples illustrate these methods and estimate Bell System's scale economies to be large.

ATLAS—An Automated Software Testing System. W. H. Jessop, J. R. Kane, S. Roy, and J. M. Scanlon, Proc. Second Int. Conf. Software Eng. (October 12, 1976), pp. 629–635.   ATS formalizes a concept of model-referenced testing for large software systems. Its object is to certify software under test against a directed-graph model. This objective is met by components of ATLAS, which automatically derive tests from the model and then apply the tests and verify the results.

Transmission Planning in International Telephony. F. T. Andrews, Jr., IEEE Trans. Commun.,   June 1976 , pp. 658–660.   A framework for controlling transmission quality of international connections is the joint responsibility of CCITT Study Groups XII, XV, XVI and Special D. These groups recommend rating methods, objectives, network plans, and equipment characteristics. Still closer cooperation may help to avoid unnecessary regional differences in equipment standards.