

# Abstracts of Papers by Bell System Authors Published in Other Journals

## CHEMISTRY

**The Chemistry of Pd-Sn Colloid Sensitizing Processes.** R. L. Cohen and R. L. Meek, *J. Colloid Interface Sci.*, 55 (1976), pp. 156-162. This research uses Rutherford backscattering and Mössbauer spectroscopy to characterize the catalytic surface produced by commercial "sensitization" processes used for electroless plating of plastics. The active agent is shown to be a colloidal Pd-Sn alloy with a particle size of about 20 Å.

**Dissociative Excitation of H<sub>2</sub>: Spectral Lineshapes and Electron Impact Cross-Sections of the Balmer Lines.** R. S. Freund, J. A. Schiavone, and D. F. Brader,\* *J. Chem. Phys.*, 64, No. 3 (February 1, 1976), pp. 1122-1127. The Balmer lines of H, when produced by electron impact dissociative excitation of low pressure H<sub>2</sub>, are much broader than the Doppler width of thermal H atoms. Excitation cross-sections show structure as a function of energy. This helps to identify two groups of dissociative states. \*Work done while a participant in the Summer Research Program at Bell Laboratories in 1975.

**Sensitization with Palladium-Tin Colloids, I: Role of Rinse and Accelerator Steps.** R. L. Cohen, R. L. Meek, and K. W. West, *Plat. Surf. Finish*, 63 (1976), pp. 52-55. In the commercial "sensitization" processes used in the manufacture of printed wiring boards, a step called "acceleration" is normally used. We show that the purpose of this step is to dissolve away a layer of stannic hydroxide, which otherwise coats and passivates the catalytic sites on the surface.

**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<sub>3</sub>Cl is extremely slow and that of CCl<sub>4</sub>, CHCl<sub>3</sub>, CH<sub>3</sub>I, CH<sub>2</sub>CCl<sub>2</sub> and the chlorinated ethylenes is negligible, implying that direct emission is responsible for the presence of these compounds.

## COMPUTING

**A Survey of Techniques for the Display of Continuous Tone Pictures on Bilevel Displays.** J. F. Jarvis, *Comput. Graph. Image Process.*, 5 (1976), pp. 13-40. Many displays are basically bilevel in nature with individual display elements, all of the same size, arranged in a rectangular array. We present a survey of processing techniques for presenting continuous tone still images on such displays. Four techniques are covered in detail while several others are covered briefly. All the techniques achieve the subjective effect of continuous tone by properly controlling only the spatial density of bilevel display states.

## ELECTRICAL AND ELECTRONIC ENGINEERING

**The Effects of Gold and Nickel Plating Thicknesses on the Strength and Reliability of Thermocompression Bonded External Leads.** N. T. Panousis and P. M. Hall, *Proc. IEEE 26th Electron. Comp. Conf.* (1976), pp. 74-79. Copper leads intended for thermocompression bonding are typically plated with Au or a combination of Ni and Au. Optimum strength and reliability with the Ni/Au system were obtained for a Ni thickness of 0.25 to 1.3 μm, a Au thickness minimum of 2.5 μm, and a Au-to-Ni ratio of ≥2.5. For Au-plated Cu leads, acceptable bonds were obtained with 0.6 μm of Au.

**Transmission Electron Microscopy of Cross-Sections of Large Scale Integrated Circuits.** T. T. Sheng and C. C. Chang, *IEEE Trans. Electron. Dev.*, ED-23 (June 1976), pp. 531-533. Accurate cross-sectional views of large scale integrated

circuits are useful for failure analysis and process evaluation. We have successfully prepared thin sections of finished devices cut perpendicular to the plane of the chip and examined them using transmission electron microscopy. We describe the sectioning procedure and show some cross-sectional views from memory cells of a CMOS RAM with poly-Si gates and tungsten second metal.

**Planar Isolated GaAs Devices Produced by Molecular Beam Epitaxy.** W. C. Ballamy and A. Y. Cho, *IEEE Trans. Electron. Dev.*, *ED-23* (1976), pp. 481-484. This paper reports the fabrication of low parasitic capacitance planar beam leaded mixer diodes. The material for low parasitic structure is produced by the simultaneous deposition of single crystal and polycrystalline gallium arsenide utilizing the molecular beam epitaxial process. Diodes measured in a double-balanced downconverter circuit showed a conversion loss of 5.3 dB at 51.5 GHz and 8.5 dB at 103 GHz. These devices exceed the performance of structurally identical devices fabricated on conventional n on n<sup>+</sup> material by about 2 dB.

## GENERAL MATHEMATICS AND STATISTICS

**Estimating Item and Order Information.** G. Sperling and M. J. Melchner, *J. Math. Psychol.* *15*, No. 2 (April 1976), pp. 192-213. In a common psychological procedure, a subject is presented a sequence of items and asked to recall them in order. His response is scored for items reported correctly in their correct positions (position score) and for items reported correctly independently of their position (item score). Equations are derived to estimate the effects of guessing and thereby to estimate "true item" and "true position" scores from observed scores.

## MATERIALS SCIENCE

**Compound-Glass Waveguides Fabricated By a Metal Evaporation Technique.** S. R. Nagel, A. D. Pearson, and A. R. Tynes, *J. Amer. Chem. Soc.*, *59* (January 1976), pp. 47-49. Glass fiber optical waveguide preforms consisting of a potassium silicate glass core and SiO<sub>2</sub> cladding were produced by a potassium metal evaporation technique. Fibers drawn from such preforms exhibit moderately low optical loss. The fabrication technique is described, and a representative loss spectrum is presented.

**The Deep Blue Maxixe-Type Color Center in Beryl.** K. Nassau, B. E. Prescott, and D. L. Wood, *Amer. Mineral.*, *61* (1976), pp. 100-107. Irradiation produces a deep blue color center in some natural beryl. Narrow band absorption in the ordinary ray and fading on heating or on light exposure distinguished this Maxixe-type beryl from aquamarine. Similar, but not identical, beryl was found in 1917 in the Maxixe mine in Brazil.

**Investigations of an Electrodeposited Tin-Nickel Alloy: I. Thermal Stability by Differential Thermal Analysis and X-Ray Diffraction.** J. E. Bennett and H. G. Tompkins, *J. Electrochem. Soc.*, *123*, No. 7 (July 1976), pp. 999-1003. Electrodeposited equiatomic tin-nickel is a metastable phase which transforms to a mixture of the equilibrium compounds Ni<sub>3</sub>Sn<sub>2</sub> and Ni<sub>3</sub>Sn<sub>4</sub>. The transition temperature can be a deciding factor for certain applications. DTA and XRD showed that on heating the alloy decomposed exothermally over the range 350 to 380°C with a maximum at 365°C.

**Origin of Surface Defects in Fe = Co/3%V Wire.** M. R. Pinnel, J. E. Bennett, and K. M. Olsen, *Wire J.*, *9* (April 1976), pp. 73-79. Good glass-to-metal vacuum seals are essential to the performance of remreed contacts. Surface defects in the magnetic wire at the seal caused problems. The source of the defects was traced to the rod surface finish prior to wire drawing. Methods to improve the finish were evaluated.

**Ternary Phase Relations in the Vicinity of Chalcopyrite Copper Gallium Sulfide:** M. Kokta, \* J. R. Carruthers, M. Grasso, H. M. Kasper, and B. Tell, *J. Electron. Mater.*, *5*, No. 1 (1976), pp. 69-89. Some of the ternary phase relations relevant to the growth of Cu<sub>1-x</sub>Ga<sub>1+x/3</sub>S<sub>2</sub> chalcopyrite crystals have been determined. Conditions necessary for the growth of stoichiometric crystals which are free of cupric sulfide precipitates and the associated green coloration are given. Such compositions

are necessary for the generation of luminescence in this compound. \* Work performed while at Bell Laboratories. Present address: Allied Chemical Corporation, Morristown, New Jersey.

## PHYSICS

**Chemisorption of Atomic Hydrogen on the Silicon (110)5×1 Surface (Ups and Leed).** T. Sakurai, K. C. Pandey, and H. D. Hagstrum, *Phys. Lett.*, *56A* (March 22, 1976), pp. 204–206. Chemisorption experiments show that the Si(110)5×1 surface when saturated with H leads to two distinct 1×1 phases depending on temperature during exposure. We suggest that while both phases are characterized by the saturation of surface dangling orbitals, additional hydrogen atoms chemisorbed weakly at nontetrahedral sites are present in the room temperature phase.

**Greater Surface Sensitivity of Ion Neutralization Spectroscopy with Respect to UV Photoemission Spectroscopy.** T. Sakurai and H. D. Hagstrum, *J. Vacuum Sci. Technol.*, *13* (January/February 1976), p. 196. Ultraviolet photoemission spectroscopy showed that the dangling-bond surface state disappears when the clean surface is exposed to atomic hydrogen. Chemisorbed hydrogen produces two sharp peaks in the surface density of states at -10 and -12 eV from the vacuum level, in good agreement with the recent theoretical works.

**Spectroscopic Observation of Very Low Energy Excitations in Glasses.** P. A. Fleury and K. B. Lyons, *Phys. Rev. Lett.*, *36*, No. 20 (May 17, 1976), pp. 1188–1191. A new experimental technique for high resolution, very high contrast light scattering spectroscopy has permitted the direct observation of very low energy excitations (0–1 K) in a variety of glassy solids. These excitations may be responsible for the anomalous specific heat, thermal conductivity, and acoustic absorption previously observed in glasses at very low temperatures (<1 K).

