650 Efficient Two-Stage Energy Transfer to Co^{2+} in Infrared Emitting Aluminate Phosphors: C. L. R. Catherall and M. J. Fuller, GE Energy Lamp Ltd., Enfield, Middlesex, England EN2.

There is an increasing use of infrared (650-800 nm) emitting lasers. LiAlO$_2$:Fe$^{3+}$ is the standard phosphor for such lasers, but the high limits in input power processing and low light levels are inadequate for some applications. We have investigated the two new phosphors, LiAlO$_2$:Cr$^{3+}$ and LiAlO$_2$:Ce$^{3+}$, which are known to be efficient infrared emitters. These phosphors have been applied to the development of high power infrared lasers.


In thin film GaN, a III-V direct bandgap semiconductor, is receiving renewed interest both for device applications and for basic materials investigations. Most GaN prepared to date has been polycrystalline, and p-type material was produced. This is the first known report of epitaxial GaN grown on sapphire substrates at elevated temperatures by chemical vapor deposition. We recently have extended this effort to examining the wavelength of the emitted light under different growth conditions.


Investigations on the cathode-ray efficiency of the red emitting phosphor Y$_2$O$_3$:Eu$^{3+}$ for particle sizes between 1.5 and 5 µm are presented. Samples with a median grain diameter of 2.2 µm exhibit an efficiency that is only 10% below that of a well-aggregated phosphor. The decrease of the efficiency for samples having grain diameters less than 2.2 µm was found to be accompanied by a reduction of the blue and green absorption bands, which is related to the activation energy of the bandgap.


LaBr$_3$:Th$_2$Br$_4$ is a sensitive, green emitting, cathode-ray phosphor. Its too strong degradation under cathode-ray excitation prevents its use in projection television tubes. By codoping LaBr$_3$:Th$_2$Br$_4$ with Cl or Br, a strong improvement of the degradation time was obtained. A comparative study of LaBr$_3$:Th$_2$Br$_4$ and the mixed halide phosphors, in the latter case showed a strong reduction in halide absorption under electron bombardment. In addition, the LaBr$_3$:Th$_2$Br$_4$ degraded mixed halide does not show F-center absorption.

NONLINEAR OPTICS AND MATERIALS

Luminescence and Display Materials/Dielectric Science and Technology

654 Nonlinear Optics at the Liquid-Solid Interface: P. Guttmann, LURE, Centre Universitaire Parist-Sud, Orsay 91405, France.

This paper reviews the nonlinear optical processes of second harmonic generation and sum frequency generation with partic­ular emphasis on their applications to the study of liquid-solid and electrochemical interfaces.


This paper summarizes the results of many of these measurements for Cu, Ag, and Au single crystal surfaces. Related studies of underpotential deposition and potential induced reconstruction of these surfaces are also discussed.


We have measured the optical second harmonic generation efficiency of Ag(111) as a function of the incident photon energy for range of electrode potentials. The results demonstrate that predictions based upon time-dependent local density functional models seriously overestimate the nonlinear response. We have identified features in the spectra of these surfaces with a band and have also discussed the effect of potential induced reconstruction of these surfaces.

657 Nonlinear Spectroscopy of Thin Epitaxial ZnSe Films on GaAs(100): M. S. Yeganeh, A. G. Yodh,* and M. C. Tamargo, Dept. of Physics, University of Pennsylvania, Philadelphia, PA 19104.

We have measured the frequency-dependent second nonlinear optical response of epitaxially grown ZnSe(100) films on GaAs(100) by resonance two-wave mixing. The interface exhibits sharp peaks at 2.72 and 2.90 eV. These peaks were identified as two photon resonances. At present we believe these peaks respectively correspond to G, transitions of ZnSe immediately above the barrier interface and E transitions of the GaAs immediately below the buried interface.

658 Coherent Interferometric Analysis of the Molecular Orientations Based on the Optical Second Harmonic Generation: O. Sato,* R. Baba, K. Hashimoto, and A. Fujishima, Dept. of Synthetic Chemistry, Faculty of Engineering, University of Tokyo, Hongo 7-3-1, Bunkyo-ku, Tokyo 113, Japan.

Interferometric study of the optical second harmonic generation from LB films was performed. It was demonstrated that the intensity of the molecule in the film made its SH radiation totally inverted in the time phase and the dephasing reaction of hemicyanine monolayer could successfully be monitored as the change of a charge pattern.


Molecules are desorbed from a surface using a femtosecond pulse of CO molecules from a Cu(111) surface with 100 fs time resolution. The molecules are found to desorb in ~325 fs after the 100 fs pump pulse. This can be explained by photon-induced desorption of the molecules from the surface. Furthermore, the ultrafast desorption time combined with a measurement of desorption yield vs. absorbed laser fluence has allowed us to identify the specific hot electron mechanism which operates.


Second-harmonic generation provides a probe of semiconductor surface properties. We have used SHG to examine the surface diffusion and desorption of hydrogen on silicon. The desorption process has been investigated through interference of the excited state with the fundamental frequency. The results demonstrate that the desorption process is not limited by the surface diffusion, but is due to a 2-D process.

661 Vibrational Dynamics of Hydrogen Terminated Stepped Si(111) Surfaces: The Role of Intersorbate Energy Transfer: M. Morris,* N. L. Imam, and A. L. Harris, AT&T Bell Laboratories, Murray Hill, NJ 07974.

Vibrational dynamics of H-terminated steered Si(111) surfaces was studied using transient sum frequency generation. The first excited state of the Si-H bond is probed by exciting the surface with a 15 fs pulse of a xenon arc laser. The resulting surface has a recombination feature from the second order motion of the monohydride adsorbed species expected for the recombination desorption of the monohydride adsorbed species to yield H$_2$ molecules. The surface diffusion process has been investigated through interference of the excited state with the fundamental frequency. These results strongly suggest that the dihydrogen step act as a trap for the vibrational energy of the terrace state; interstitials energy transfer is an efficient process on these stepped surfaces.


The bleaching recovery time of the C-H stretching vibration of methyl iodide in an ordered overlayer on Ag(111) is measured by picosecond sum frequency generation. A biexponential decay is observed, with a slow component exhibiting a temperature dependent rate constant. We establish that the energy initially leaves the methyl component into other adsorbate vibrations and speculate on the detailed mechanism.