AFFIDAVIT OF Pamela Stansbury

STATE OF NEW YORK)
) ss.
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Pamela Stansbury being of full age and duly sworn, deposes and says as follows:

1. I am an employee of the Cornell University Library, and specifically Library Technical Services, located at Cornell University, Ithaca, New York 14853. I have personal knowledge of the facts set forth below.

2. I am the Administrative Supervisor in Library Technical Services, which maintains bibliographical and processing information for many historical documents. I have held such position since 1996.

3. Included in the Library's historical collection are various publications. As part of that collection, the Library maintains custody of an original issue of **Journal of Luminescence, Volumes 60 & 61, April 1994,** which includes the paper ***Cathodoluminescence of Ce: La2Be2O5 Single Crystals*** / by D.M. Gualtieri.

4. Mr. Richard F. Moncrief requested information about **Journal of Luminescence, Volumes 60 & 61, April 1994** – specifically when this item was first made publicly available by the Library. As best I can determine, the publication was publicly available at the Cornell University Library as June 23, 1994.

Pamela Stansbury (signature)
Pamela I. Stansbury (name printed)

Sworn to before me this
13th day of December 2016
Lyndsi R Prignon
Notary Public

LYNDSI R. PRIGNON
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R.S. MELTZER

Department of Physics and Astronomy
The University of Georgia

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Contents

Preface vii

Committees ix

Contents. xi

Announcement of the ICL '93 prize recipient. xxvii

Section 1. Bulk semiconductors

Two-photon spectroscopy of 1S-excitons in an AC electric field
G. Biese, D. Fröhlich, W. Nieswand, E. Mohler 1

Fluorescent decay times of excitons bound to oxygen traps in ZnTe:O
Y. Burki, W. Czaja, V. Capozzi, P. Schwendimann 4

Photoluminescence spectra of trivalent praseodymium implanted in semi-insulating GaAs
L.E. Erickson, U. Akano, I. Mitchell, N. Rowell, A. Wang 8

Optical gain in ZnTe/GaAs epitaxial layers grown by MOVPE
F.A. Majumder, H. Kalt, C. Klingshirn, A. Naumov, H. Stanzl, W. Gebhardt. 12

Spectroscopic detection of the $V^+(d^4)$ acceptor state in zinc selenide and zinc sulfide
G. Goetz, U.W. Pohl, H.-J. Schulz, M. Thiede 16

Excited-state absorption of ZnSe doped with cobalt
A. Ehlert, J. Dreyhsig, H.-E. Gumlich, J.W. Allen 21

Exciton–phonon interaction and energy transfer of nitrogen-bound excitons in GaP
T. Bouma, A.J. Scholten, H.A. Zondag, Tj. Luijendijk, J.I. Dijkhuis 26

Donor–acceptor pair decay and evaluation of the recombination constant and the Bohr radii of shallow impurities in ZnSe
G.-J. Yi, G.F. Neumark 29

Optically stimulated fluorescent emission in $Ca_{1-x}Sr_xS$:Ce
D. Maneval, B. Ray, I.V.F. Viney, J.W. Brightwell, B.W. Arterton. 32

Specular optical activity and specular gyrotropic linear dichroism in semiconductors
A.R. Bungay, Y. Pointel, N.I. Zheludev 36

Microwave modulated and thermal modulated photoluminescence studies of PbI_2 layered semiconductor
E. Lifshitz, L. Bykov, B.M. Ashkinadze 40

Fine structure of zero-phonon lines in polymorphic ZnS:Fe^{2+}
B. Litzenburger, U.W. Pohl, H.-E. Gumlich 44

ELSEVIER

Journal of Luminescence 60&61 (1994) 127–130

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Cathodoluminescence of Ce : $La_2Be_2O_5$ single crystals

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Abstract

$Ce^{3+}:Y_3Al_5O_{12}$ (Ce : YAG) is an important phosphor in high intensity CRT displays since it does not saturate at high electron beam power. The saturation power level is of the order of 1 W/cm^2 for most cathodoluminescent materials, and this limits the maximum surface brightness of a typical cathode ray tube. However, Ce^{3+} : YAG has been found to be linear to at least 10^4 W/cm^2. This performance has encouraged our examination of another cerium activated phosphor, lanthanum beryllate, Ce : $La_2Be_2O_5$ (Ce : BEL). A crystal of lanthanum beryllate activated with a cerium concentration of 410^{18} atoms/cm^3 was grown by the Czochralski crystal growth technique. Wafers were prepared from the crystal and analyzed in both the as-grown state and after annealing in a flowing atmosphere of 10% by volume hydrogen in argon at 1150 °C for 4 h. Cathodoluminescent measurements revealed a broadband blue emission of 100 nm width centered at 480 nm, a blue-shifted analog of the Ce : YAG spectrum. A linear efficiency of 0.13 lm/W was found to a power loading of 8 W/cm^2. Pulsed excitation of a Ce : BEL crystal by 375 nm radiation produced by frequency doubling of a 750 nm laser demonstrated a decay time of the fluorescence of the order of 50 ns. All these data show that Ce : $La_2Be_2O_5$ is an excellent candidate as a blue phosphor for high intensity CRT applications, particularly for high resolution projection displays using single crystal faceplates.

1. Introduction

Conventional CRT faceplates are formed by the deposition of phosphor powder on the inside of a glass envelope of limited thermal conductivity. The image resolution and power capabilities of these faceplates are limited, and many applications now require CRT performance at the limits of phosphor faceplate technology. The resolution of conventional faceplates is limited by phosphor particle size to about 20 μm. Long-term operation at high intensity is limited by a decomposition threshold of about 1 W/cm^2. Short-term operation at high intensity is limited by saturation effects which, aside from thermal quenching and space charge build-up, arise from activator ground state depletion, excited stated absorption and cross-relaxation processes. Activator ground state depletion as a consequence of long fluorescent decay time is a general feature of phosphors [1]. Phosphor particles will actually melt at about 5 W/cm^2. High-intensity operation also limits phosphor lifetime by a process called coulombic degradation. This failure mode reduces the intensity of P53, a standard phosphor, to 50% of its initial value after an electron dosage of 140 C/cm^2. This leads to a CRT lifetime in a high luminance application of about 1000 h under the best conditions.

Single crystal cathode ray tube faceplates have several significant advantages over powder phosphor faceplates. Since single crystals have no granulation, resolution is limited only by the dimension of the electron beam. Single crystal

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