Home > Invertebrate Zoology > Biological Science > Entomology > Zoology > Traps Article Dual role of Sb ions as electron traps and hole traps in photorefractive Sn_2P_2S_0 December 2016 · Optical Materials Express 6(12):3992 Dol:10.1364/OME.6.003992 Authors: B. E. Kananen Eric Golden Air Force Institute of Technology	6 crystals S. A. Basun D. R. Evans
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Abstract Doping photorefractive single crystals of Sn2P2S6 with antimony introduces both electron and hole traps. In as-grown crystals, Sb ³⁺ (5s ²) ions replace Sn ²⁺ ions. These Sb ³⁺ ions are either isolated (with no nearby perturbing defects) or they have a chargecompensating Sn ²⁺ vacancy at a nearest-neighbor Sn site. When illuminated with 633 nm laser light, isolated Sb ³⁺ ions trap electrons and become Sb ²⁺ (5s ² 5p ¹) ions. In contrast, Sb ³⁺ ions with an adjacent Sn vacancy trap holes during illumination. The hole is primarily localized on the (P2S6) ⁴⁻ anionic unit next to the Sb ³⁺ ion and Sn ²⁺ vacancy. These trapped electrons and holes are thermally stable below ~200 K, and they are observed with electron paramagnetic resonance (EPR) at temperatures below 150 K. Resolved hyperfine interactions with ³¹ P, ¹²¹ Sb, and ¹²³ Sb nuclei are used to establish the defect models.	Discover the world's research • 20+ million members • 135+ million publications • 700k+ ^I Join for free
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... These experimental results correlate well with ab initio calculations of the electron spectra in the Sn2P2S6 with various defects. Partially, these calculations in the Sn2P2S6 lattice with two defects (Cu and Sb), located in the same unit cell, give an explanation of the absence of the compensations processes in the double-doped crystal: as it was shown in [4], the Sb 3+ impurity replaces the Sn 2+ cations, and the charge conservation ensures an appearance the Sn vacancies that lead to formation the defects of two types. The Cu 1+ impurity, located near Sb 3+, partially compensates the charge that prevents the appearance of Sn vacancies. ... Mouffication of the Optical and Dielectric Parameters in Doped Sn 2 P 2 S 6 Crystals Conference Paper Full-text available

Oct 2020

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... As described in Eq. (7), the holes produced by the 1064 nm light during the first step are trapped at complex defects (Sb-V Sn) À and form paramagnetic (Sb-V Sn) 0 defects. 25 There also may be other defects in the crystal that can trap holes at a low temperature, but were not seen with EPR. At room temperature, the processes in Eqs. ...

Near-infrared-sensitive photorefractive Sn 2 P 2 S 6 crystals grown by the Bridgman method

Article

Mar 2020 · <u>J APPL PHYS</u>

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... Besides, the model calculation of the electron spectra in the Sn2P2S6 lattice with two defects (Cu and Sb) in the same cell give an explanation of the absence of the compensations processes in the double-doped crystal. As it was shown in [4], the Sb 3+ impurity replaces the Sn 2+ cations, charge-compensated by appearance the Sn vacancies: (3Sn 2+ + 2VSn 2-) 0. This leads to formation the defects of two types, that can be a reason of the electron-hole compensation at the formation of the photorefractive holograms in the Sb-doped crystals. ...

Mouification of the photorefractive Sn2P2S6 crystals by doping and post-growth treatments

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Oct 2019

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... The Mn 2+ signal measured in MgWO 4 does not lose its intensity upon the Xray irradiation. Sb 3+,5+ are also expected to trap holes [30]. Moreover, referring to the purity of the starting materials for the crystals synthesis given in Ref. [3], no antimony, praseodymium and rhenium ions could be expected in the samples studied. ...

Study of charge carrier trapping by EPR and TSL methods in ZnxMg1-xWO4 single crystals

Article

Sep 2019 · <u>OPT MATER</u>

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Photoinduced trapping of charge at sulfur vacancies and copper ions in photorefractive Sn 2 P 2 S 6 crystals

Article

Feb 2021 · <u>J APPL PHYS</u> T. D. Gustafson · C Eric Golden · E. M. Scherrer · Larry E. Halliburton

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Charge trapping by iodine ions in photorefractive Sn 2 P 2 S 6 crystals	
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Transient EPR emission spectra of a free radical trapped in a single crystal of chloranil

July 1993 · Chemical Physics Letters

Carlo Corvaja · O Lorenzo Franco · Luigi Pasimeni · [...] · O Luciano Montanari

The EPR spectrum of a free trapped in single crystals of chloranil changes its phase from absorption to emission when the crystal is illuminated by visible light. The time evolution of the EPR signal is discussed in terms of the interaction between the doublet species and triplet excitons produced by light excitation.

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Green luminescence from Cu-diffused LiGaO2 crystals

February 2016 · Journal of Luminescence

N. C. Giles · L. E. Halliburton · M.S. Holston · [...] · I.P. Ferguson

An intense green luminescence is observed from single crystals of LiGaO2 doped with copper. Czochralski-grown undoped crystals are wrapped in thin copper foil and then held at 900 °C for 1 h in a flowing nitrogen atmosphere. Large concentrations of Cu+ ions enter the crystals during this process and occupy Li+ sites. These copper-diffused crystals are characterized with optical absorption, ... [Show full abstract]

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Identification of point defects in hydrothermally grown KTiOPO4

October 1991 · Journal of Applied Physics

L. E. Halliburton · Mike Scripsick · G. J. Edwards · R. F. Belt

Electron paramagnetic resonance has been used to investigate radiation-induced point defects in hydrothermally grown single crystals of potassium titanyl phosphate (KTiOPO 4 or KTP). The crystals were irradiated at 77 K with 60–kV x rays. A trapped-hole center, a Ti³⁺ center, and a Pt³⁺ center were observed between 10 and 30 K after the initial 77-K irradiation. These ... [Show full abstract]

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Article

Electron Paramagnetic Resonance Study of y-Ray Irradiated Phosphate Glasses

August 1965 · Bulletin of the Chemical Society of Japan

Yasuo Nakai

The EPR spectrum, consisting of a two-line structure and two other distinct types of weak resonances, obtained from irradiated phosphate glasses suggests that these paramagnetic centers are connected with the peculiar structure of phosphate glasses. The two-

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Identification of native defects (vacancies and antisites) in CdSiP2 crystals

November 2015 · Journal of Applied Physics

Eric Golden · N. C. Giles · Larry E. Halliburton · [...] · E.S. Maniego

Electron paramagnetic resonance (EPR) is used to identify four native defects in single crystals of CdSiP2. This nonlinear optical material is used in optical parametric oscillators to generate tunable output in the mid-infrared. The performance of these frequency-conversion devices is limited when infrared absorption bands associated with native defects overlap a pump wavelength. Cadmium, ... [Show full abstract]

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Electron Paramagnetic Resonance and Electrical Properties of the Dominant Paramagnetic Defect in Ele...

September 1966 · Physical Review

Nissim Almeleh · Bernard Goldstein

Lattice defects having strong paramagnetic resonances are introduced into p-type silicon that has been bombarded with electrons. We have studied the paramagnetic properties and growth of the dominant defect so introduced (the K center) as functions of electron flux and bombardment energy under conditions of different resistivities, impurity dopants, and illumination. The defect has a spin of 1/2 ... [Show full abstract]

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Sn vacancies in photorefractive Sn2P2S6 crystals: An electron paramagnetic resonance study of an opt...

October 2016 · Journal of Applied Physics

Dual role of Sb ions as electron traps and hole traps in photorefractive Sn_2P_2S_6 crystals | Request PDF

Eric Golden · S. A. Basun · D. R. Evans · [...] · Larry E. Halliburton

Electron paramagnetic resonance (EPR) is used to identify the singly ionized charge state of the Sn vacancy (V Sn - I) in single crystals of Sn2P2S6 (often referred to as SPS). These vacancies, acting as a hole trap, are expected to be important participants in the photorefractive effect observed in undoped SPS crystals. In as-grown crystals, the Sn vacancies are doubly ionized (V Sn 2 - I) with no ... [Show full abstract]

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Article

Resistance switching of La doped SrTiO3 single crystals

September 2018 · Acta Physica Sinica - Chinese Edition-

G.-H. Li · W.-Y. Xia · X.-W. Sun

To date, there has not been a consensus about the resistance switching mechanism of donor-doped SrTiO3. The La doped STO (LaSTO) single crystal is a donor-doped material and has an N-type conductivity since La³⁺could easily substitute Sr²⁺. In this study, the Pt/LaSTO/In memory device is fabricated based on (100) LaSTO single crystal with 0.5 wt% La doping. Through a series of electrical tests, ... [Show full abstract]

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EPR spectroscopy of platinum-hydrogen complexes in silcon

June 1994 · Physical review. B, Condensed matter

M. Höhne · U. Juda · Yu. V. Martynov · [...] · Leonid S. Vlasenko

Two similar defects in silicon, resulting from doping with platinum in an atmosphere containing water vapor, were studied by means of electron paramagnetic resonance. Both spectra have effective electron spin S=1/2, and exhibit platinum- and hydrogen-related hyperfine structure and remarkable behavior under band-gap illumination. One of the centers has been identified with the recently reported ... [Show full abstract]

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Characterization of a silicon-related defect detected by its excited triplet state in electron-irrad...

February 2011 · Physical review. B, Condensed matter

Jérémie Lefèvre · J. M. Costantini · Didier Gourier · [...] · Guillaume Petite

Using electron paramagnetic resonance (EPR) under band-gap illumination, we show experimental evidence of a defect center in ntype cubic silicon carbide (3C-SiC) single crystal irradiated with 1-MeV electrons. This defect is diamagnetic (S=0) in its ground state and can be pumped into a paramagnetic (S=1, MS=0) state by above-band-gap photon excitation, where it is detected by EPR absorption and ... [Show full abstract]

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