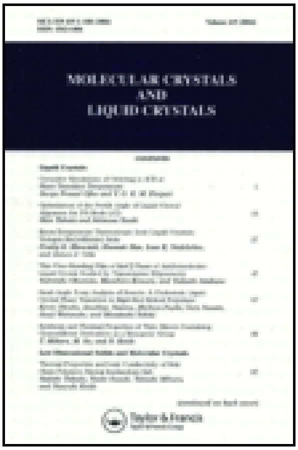
This article was downloaded by: [Tomsk State University of Control Systems and Radio]
On: 18 February 2013, At: 14:48
Publisher: Taylor & Francis
Informa Ltd Registered in England and Wales Registered Number: 1072954
Registered office: Mortimer House, 37-41 Mortimer Street, London W1T 3JH, UK



Molecular Crystals and Liquid Crystals Science and Technology. Section A. Molecular Crystals and Liquid Crystals
Publication details, including instructions for authors and subscription information:
http://www.tandfonline.com/loi/gmcl19

Spectral Hole Burning in Neutron Irradiated Ruby Crystals

I. Sildos [a], U. Bogner [a b], I. Dolindo [a] & J. Kikas [a]
[a] Institute of Physics, Estonian Acad. Sci., Tartu, ESTONIA
[b] Inst. of Physics III, Univ. of Regensbirg, Regensburg, FRG
Version of record first published: 04 Oct 2006.

To cite this article: I. Sildos, U. Bogner, I. Dolindo & J. Kikas (1992): Spectral Hole Burning in Neutron Irradiated Ruby Crystals, Molecular Crystals and Liquid Crystals Science and Technology. Section A. Molecular Crystals and Liquid Crystals, 217:1, 119-120

To link to this article: http://dx.doi.org/10.1080/10587259208046887

PLEASE SCROLL DOWN FOR ARTICLE

Full terms and conditions of use: http://www.tandfonline.com/page/terms-and-conditions

This article may be used for research, teaching, and private study purposes. Any substantial or systematic reproduction, redistribution, reselling, loan, sub-licensing, systematic supply, or distribution in any form to anyone is expressly forbidden.

The publisher does not give any warranty express or implied or make any representation that the contents will be complete or accurate or up to date. The accuracy of any instructions, formulae, and drug doses should be independently verified with primary sources. The publisher shall not be liable for any loss, actions, claims, proceedings, demand, or costs or damages whatsoever or howsoever caused arising directly or indirectly in connection with or arising out of the use of this material.

Mol. Cryst. Liq. Cryst. 1992, Vol. 217, pp. 119–120
Reprints available directly from the publisher
Photocopying permitted by license only
© 1992 Gordon and Breach Science Publishers S.A.
Printed in the United States of America

Downloaded by [Tomsk State University of Control Systems and Radio] at 14:48 18 February 2013

SPECTRAL HOLE BURNING IN NEUTRON IRRADIATED RUBY CRYSTALS

I.SILDOS, U.BOGNER*, I.DOLINDO and J.KIKAS
Institute of Physics, Estonian Acad. Sci., Tartu, ESTONIA
*Inst. of Physics III, Univ. of Regensbirg, Regensburg, FRG

Abstract Spectral hole burning was performed in neutron-irradiated ruby. Additional lines were found in the spectra of photoproduct, which were caused by Cr ions. Hole burning mechanisms are discussed in such defective crystals.

Neutron irradiation and the subsequent thermal annealing of α-Al_2O_3 leads to the creation of different kinds of defect aggregates, e.g. Ref.[1] The results of spectral hole burning in such defective crystals are somewhat surprising. Namely, spectral hole in these samples reveal very high thermostability: the spectral holes burnt in at low (LHe) temperature are not erased even on the temperature rising up to 670 K, the limit of their thermoresistance being determined by the destructive processes of defect aggregates. This result is valid both on one-step and two-step spectral hole burning in neutron-irradiated α-Al_2O_3[2,3]. Thanks to birefringence of sapphire the burning under certain conditions leads to the formation of permanent spectral-spatial gratings.[4]

All the above-mentioned features make a good basis for the application of these crystals as materials for information storage and processing as well as for constructing units for optical and laser devices.

The aim of this investigation was to get information and to make models for the mechanisms of hole burning and the extremely high thermostability of holes in this kind of materials. For this purpose the neutron-irradiated ruby was used. Burning efficiency and thermostability of the holes were compared with the results obtained for neutron-irradiated α-Al_2O_3. Additional lines were found in the photoproduct spectra (in 503 nm spectral range), which were caused by Cr^{3+} ions.

In[2,5] photoionization as a mechanism of hole burning was proposed, where in principle the trapping of an optical electron may take place in two ways: by means of a nearby-situated acceptor or on the excitation of electron into the conduction band. Here another interesting mechanism is discussed, where analogously with the hole-burning mechanism in $SrF_2:Pr^{3+}:D^-$, after optical excitation of defect an essential rearrangement of the surrounding of the defect is triggered[6].

REFERENCES

1. E.W.J. Mitchell, J.D.Rigden and P.D. Townsend, *Philosophical Magazine*, *5*, N 58, 1013 (1960).
2. I. Sildos, M. Aizengendler, I. Dolindo and I. Renge, *Optics Commun.*, *73*, 223 (1989).
3. M. Aizengendler, U. Bogner, I. Dolindo, J. Kikas and I. Sildos, *Chem. Phys. Letters*, *183*, 245 (1991).
4. I. Sildos, M. Aizengendler and I. Dolindo, *Optics Commun.*, *81*, 43 (1991).
5. V.I. Baryshnikov, E.F. Martynovich, L.U. Shchepina and T.A. Kolesnikova, *Opt. Spectroscopy*, *64*, 273 (1988).
6. T. Attenberger, I. Sildos, G. Jones, U. Bogner and M. Maier, in: Abstr. of 6th Europhysical Topical Conf. *"Lattice Defects in Ionic Materials"*, Sept. 1990, Groningen, The Netherlands, p. 123.

Downloaded by [Tomsk State University of Control Systems and Radio] at 14:48 18 February 2013