

International conference



Laser Applications in Life Sciences

June 9 – 11, 2010 Oulu, Finland

LAS 2010

BOOK OF ABSTRACTS



International Conference

Laser Applications in Life Sciences LALS-2010

9-11 June Oulu, Finland

Book of Abstracts

Alexey Popov, Alexander Bykov, Eija Vieri-Gashi, Matti Kinnunen (Eds.)

UNIVERSITY OF OULU
P.O.BOX 8000
90014 UNIVERSITY OF OULU, FINLAND

All rights reserved.

ISBN 978-951-42-6226-5

Cover photo

Jakub Czajkowski

TAMPERE UNIVERSITY PRESS – JUVENES PRINT
TAMPERE 2010

CONTENTS

General information	
Organizers and sponsors, co-operating organization	4
Forword	5
Committees	6
Key topics	7
Best young scientist's paper award	7
Meeting venue (with the map of the conference place)	8
Exhibition	
List of companies	9
Exhibition area 1	10
Exhibition area 2	11
Confrence program	12
Abstracts	
Oral Sessions	
Plenary lectures	23
Nano-Biophotonics I-III	27
Single Cells and Molecules I-III	39
Novel Optical Devices for Biomedicine I-III	51
Laser Microscopies I-III	63
THz Waves in Biophotonics I-IV	77
Laser-Tissue Interactions I-IV	91
Molecular and Bio-Imaging I-IV	109
Symposium on Water in Bioenvironment I-IV	125
Laser Biomedical Diagnostics, Sensing and Therapy I-IV	137
Laser-Tissue Interactions V-VII	157
Vibrational Spectroscopy, Structure and Dynamics of Biological Systems I-IV	175
Printing Techniques and Their Applications in Biotechnology I	191
Poster sessions	
Nano-Biophotonics	197
Laser-Tissue Interactions	209
Laser Biomedical Diagnostics, Sensing and Therapy	229
Single Cells and Molecules	247
THz Waves in Biophotonics	253
Vibrational Spectroscopy, Structure and Dynamics of Biological Systems	259
Molecular and Bio-Imaging	271
Laser Microscopies	281
Novel Optical Devices for Biomedicine	285
Printing Techniques and Their Applications in Biotechnology	295
Symposium on Water in Bioenvironment	297
Author index	299
Advertisements	

Raman Investigations of Bio-SiC Ceramics

V.O. Yukhymchuk¹, V.S. Kiselov¹, A.E. Belyaev¹, M.V. Chursanova², M.Ya. Valakh¹,
M. Danailov³, and I.A. Khodasevich⁴

¹V.E. Lashkaryov Institute of semiconductor physics, National academy of sciences of Ukraine, 45
Prospect Nauky, 03028 Kyiv, Ukraine

²National Technical University of Ukraine "KPI", 37 Prospect Peremohy, 03056, Kyiv, Ukraine

³Sincrotrone Trieste S.C.p.A. di interesse nazionale Strada Statale 14 - km 163,5 in AREA Science
Park 34149 Basovizza, Trieste ITALY

⁴B.I. Stepanov Institute of Physics of National Academy of Sciences of Belarus, 220072 Minsk,
Belarus

afina55@ukr.net

Abstract: Structural properties of biomorphic SiC ceramics are investigated by Raman spectroscopy. Compressive stress in residual silicon inclusions inside pores is detected. Presence of graphite clusters is revealed with help of surface enhanced Raman spectroscopy. **Keywords:** bio-SiC, Raman spectroscopy, SERS

In recent years new materials for bioimplants and lightweight structural components fabrication is getting a great interest. One of the aforementioned materials is biomorphic SiC (bio-SiC). It is produced from natural wood precursors by pyrolysis in argon or N₂ and subsequent forced infiltration of obtained biocarbon template with liquid silicon at high temperatures. Resulting bio-SiC material preserves structural hierarchy and open porosity of initial wood, but acquires high durability and rather good mechanical properties with respect to compression and flexure. Moreover, details of complicated form can be easily shaped from wood before the pyrolysis process. The component composition of the SiC/Si/C composite samples obtained depends on $\gamma = \text{Si/C}$ mass ratio during fabrication in crucible and other technological conditions.

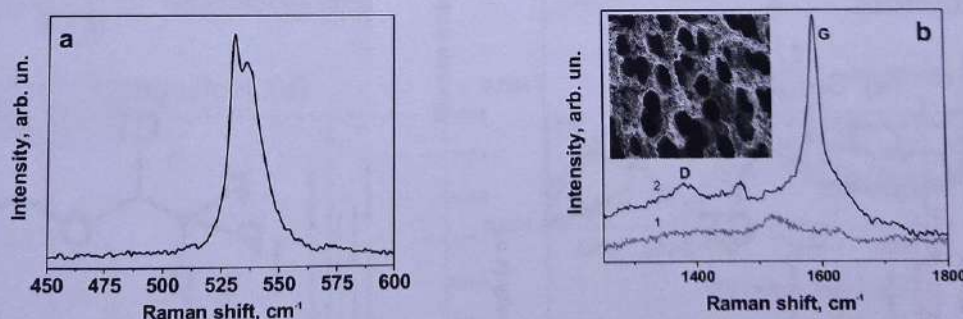


Figure 1. Raman spectra of bio-SiC in (a) Si-Si and (b) C-C vibrations region: 1 – without surface enhancement; 2 – with surface enhancement. Inset shows SEM-image of investigated structure.

Bio-SiC structure investigations by means of Raman spectroscopy have allowed to establish that synthesis temperature $\sim 1550^\circ\text{C}$ results in 3C-SiC polytype formation. Increase of synthesis temperature leads to 3C as well as 6H SiC formation. Further temperature increase up to 2100°C results in increase of 6H polytype fraction. For composites with the mass ratio $\gamma > 2.33$ the bands are observed around $520\text{--}540\text{ cm}^{-1}$ which evidence the presence of residual silicon, which is under great compressive stress, inside the SiC pores (Fig. 1 a). Using of surface enhancement effect by silver nanocrystal film deposited on bio-SiC has allowed us to register D (1355 cm^{-1}) and G (1607 cm^{-1}) lines in C-C vibrations range, which correspond to disordered carbon phase and graphite phase, respectively (Fig. 1 b).