

LUMINESCENT PROPERTIES OF POROUS SILICON CARBIDE



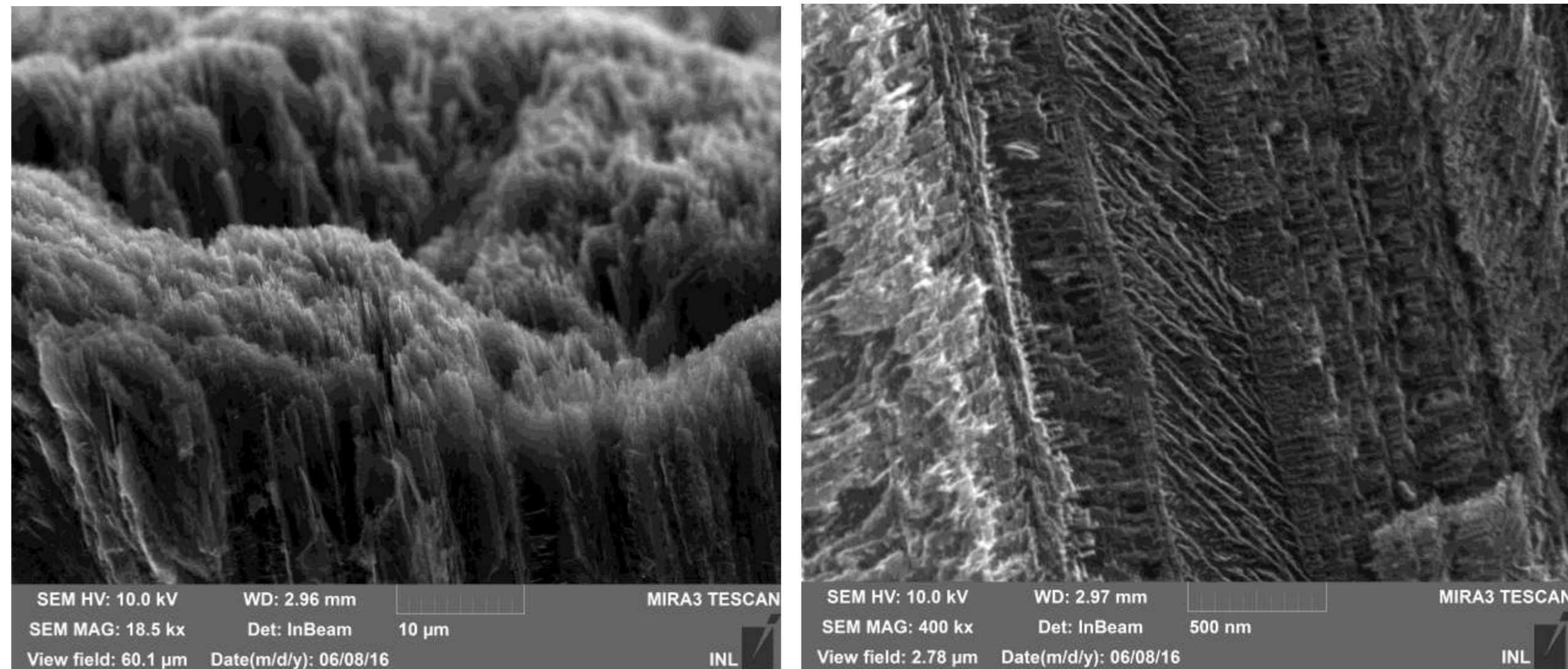
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Motivation: to study the structures and luminescence properties of porous SiC for efficient nanoscale light emitters

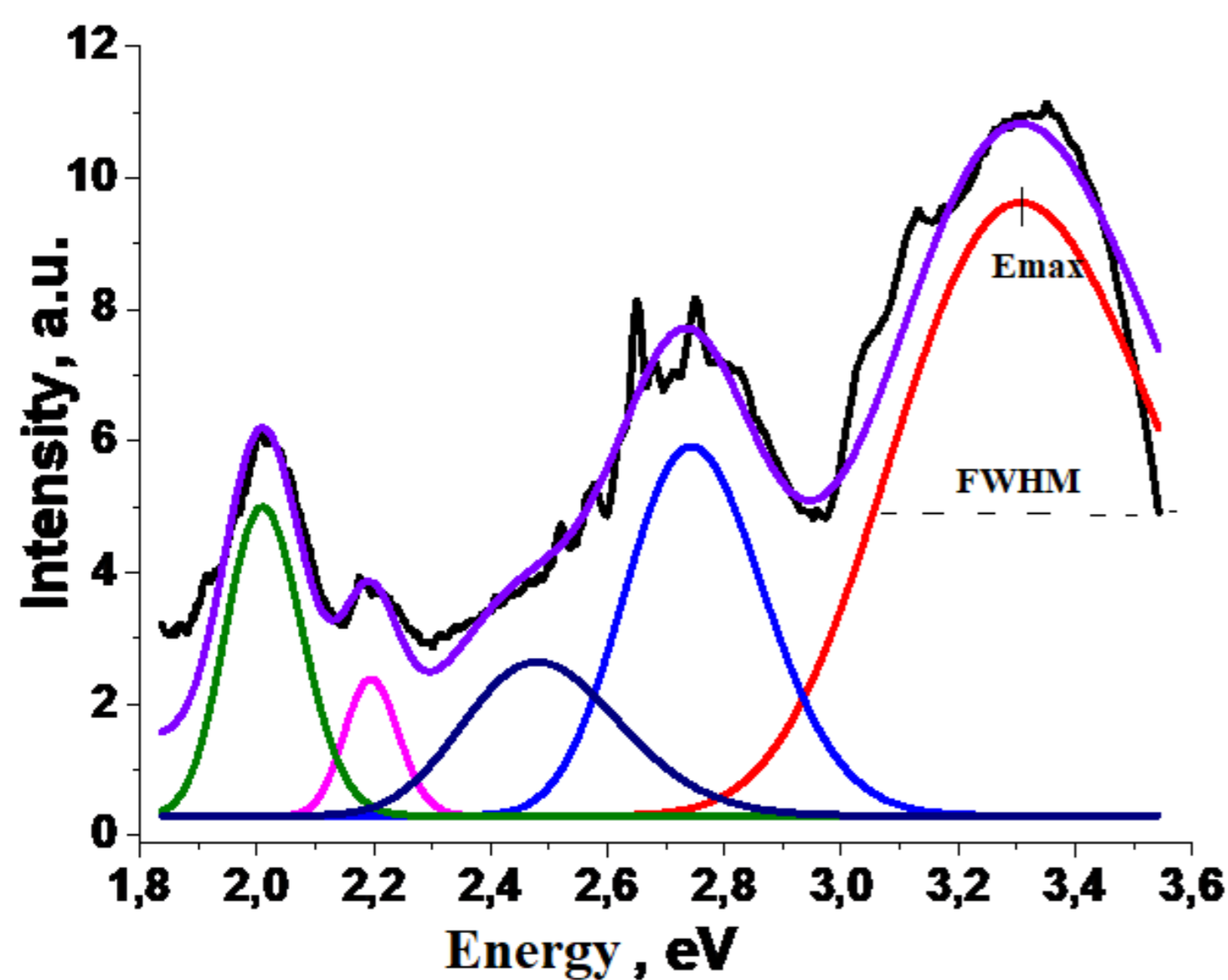
Free standing PSiC layers were produced by electrochemical etching of 3C-SiC monolithic polycrystalline wafers with the resistivity $\rho=4$ m Ω ·cm (n-type). In brief, the etching was carried out in 13% (wt.) aqueous HF at a current density 50 mA·cm⁻² for 180 min without additional stirring. To peel the PSiC layer from the plate, an additional etching in HF(48% aq.)/EtOH (1:1 v/v) for 15 min at 50 mA·cm⁻¹ was applied

Electronic microscopy images of PSiC free-layer



A. SEM image of outer surface; B. SEM image of the cross-section;

Photoluminescence spectra of free standing PSiC



Parameters of PL spectra decomposition

sample A				sample B			
Front side		Back side		Front side		Back side	
E_{max} , eV	FWHM, eV	E_{max} , eV	FWHM, eV	E_{max} , eV	FWHM, eV	E_{max} , eV	FWHM, eV
3,27	0,36	3,14	0,7	3,31	0,48	3,12	0,6
2,74	0,23	2,73	0,25	2,74	0,38	2,68	0,3
2,48	0,3	2,48	0,6	2,48	0,48	2,48	0,55
2,19	0,06	2,145	0,25	2,19	0,14	2,19	0,3
2	0,17	1,98	0,12	2	0,2	1,98	0,15

Conclusions

This paper presents the results of the photoluminescent (PL) studies of freestanding porous SiC layers formed from the SiC plate by electrochemical etching. The porous layers' photoluminescence was characterized by an emission band in the visible region in which three peaks can be distinguished. The nature of the low-energy peak is explained by the electron-hole recombination at some localized states; the other peak is related to the CFO; the high energy peak can be explained by SiC nanocrystallites.

Reference

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- N. Naderi, M. R. Hashim, K. M. A. Saron, and J. Rouhi, 'Enhanced optical performance of electrochemically etched porous silicon carbide', Semicond. Sci. Technol.-2013.- vol. **28**, №2, P. 025011

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