ИОННАЯ ИМПЛАНТАЦИЯ: ПОРИСТЫЙ ГЕРМАНИЙ

Андрей Львович Степанов

В.И. Нуждин, В.Ф. Валеев, А.М. Рогов, Д.А. Коновалов

Лаборатория нанооптики и наноплазмоники

aanstep@gmail.com

Казанский физико-технический институт им. Е.К. Завойского ФИЦ КазНЦ РАН

Российский научный фонд

№ 19-79-10206

№ 17-12-01176

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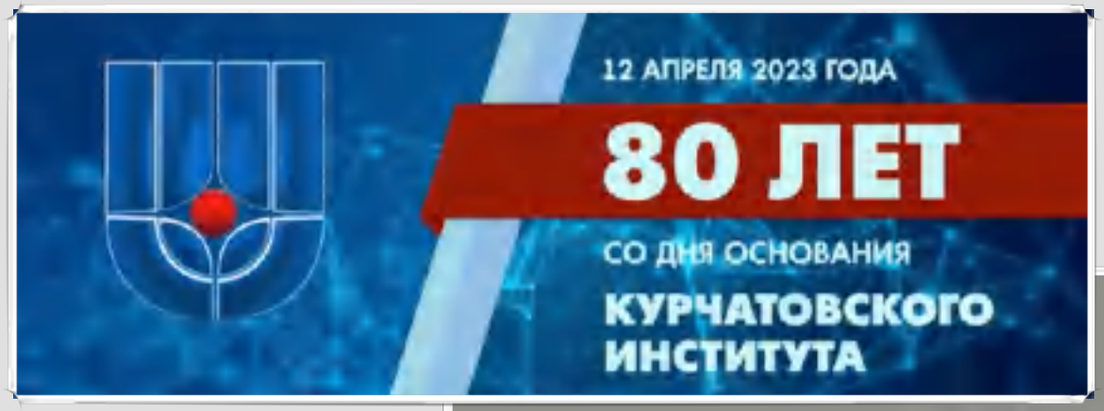

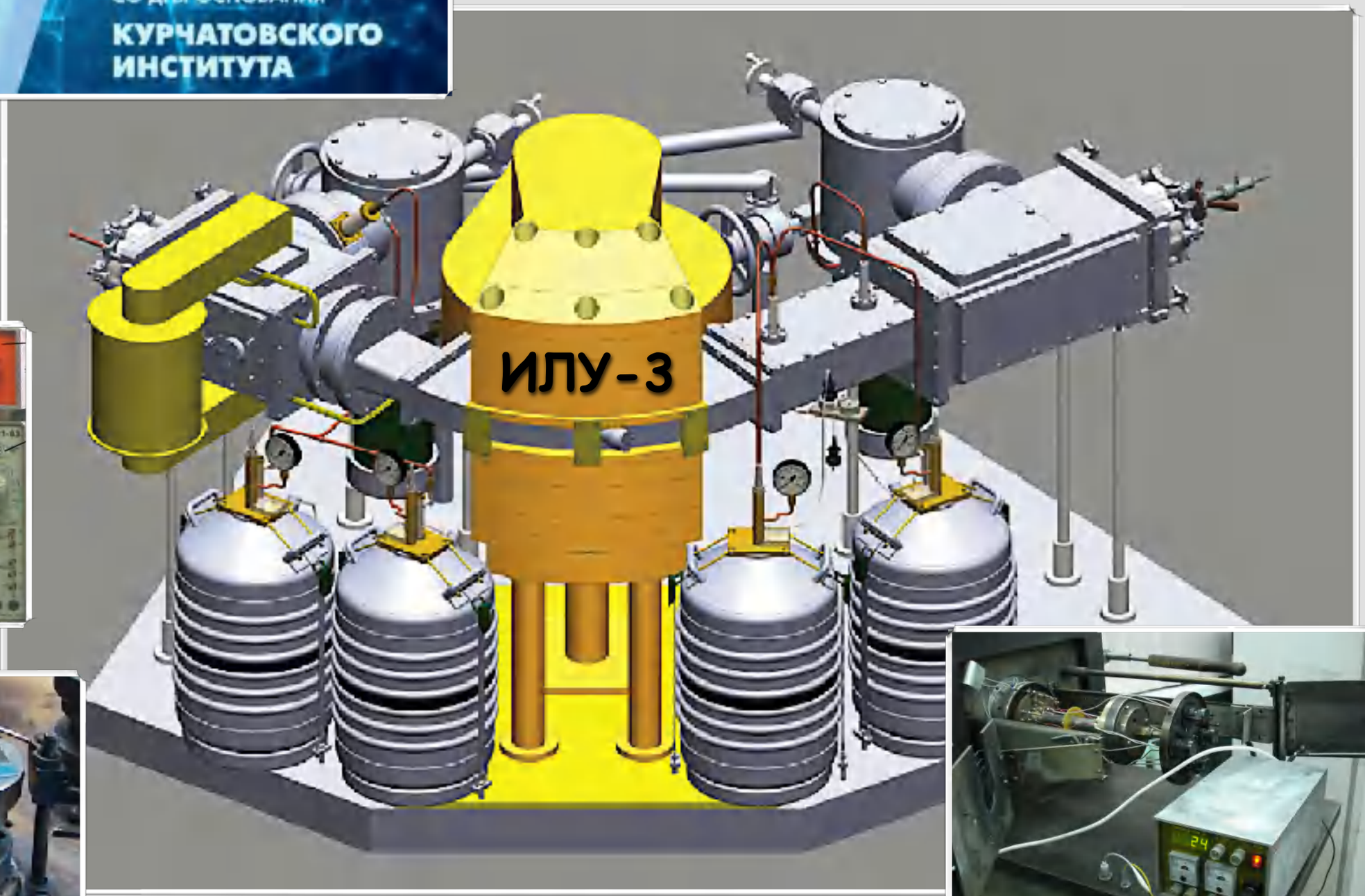

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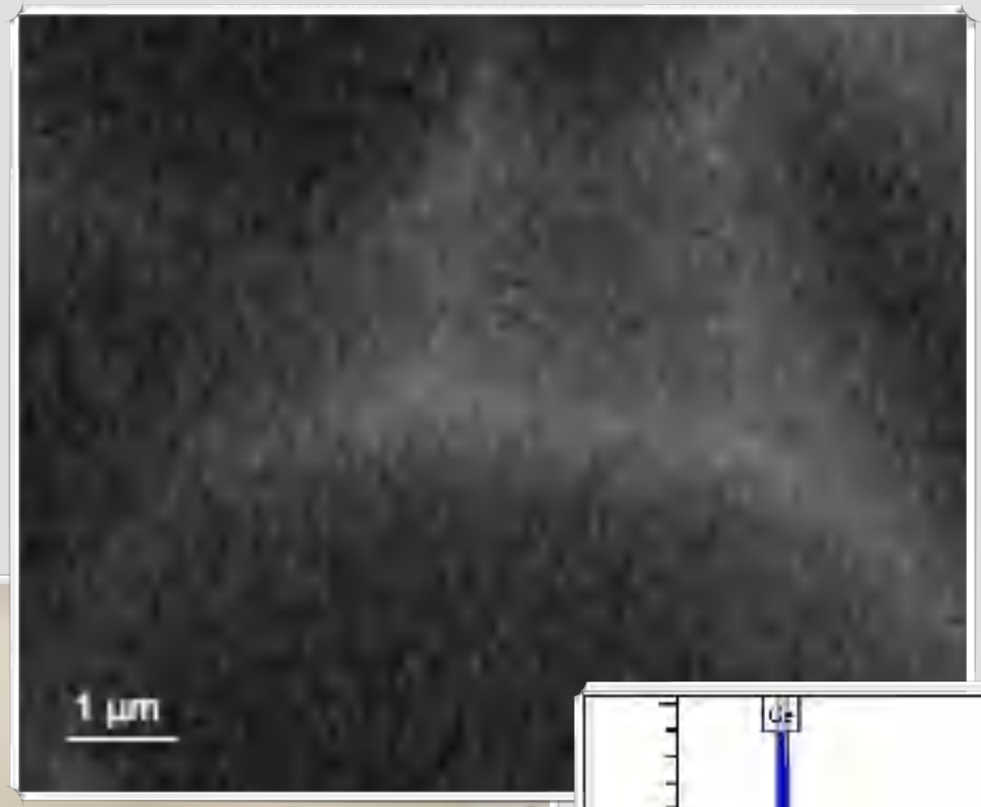

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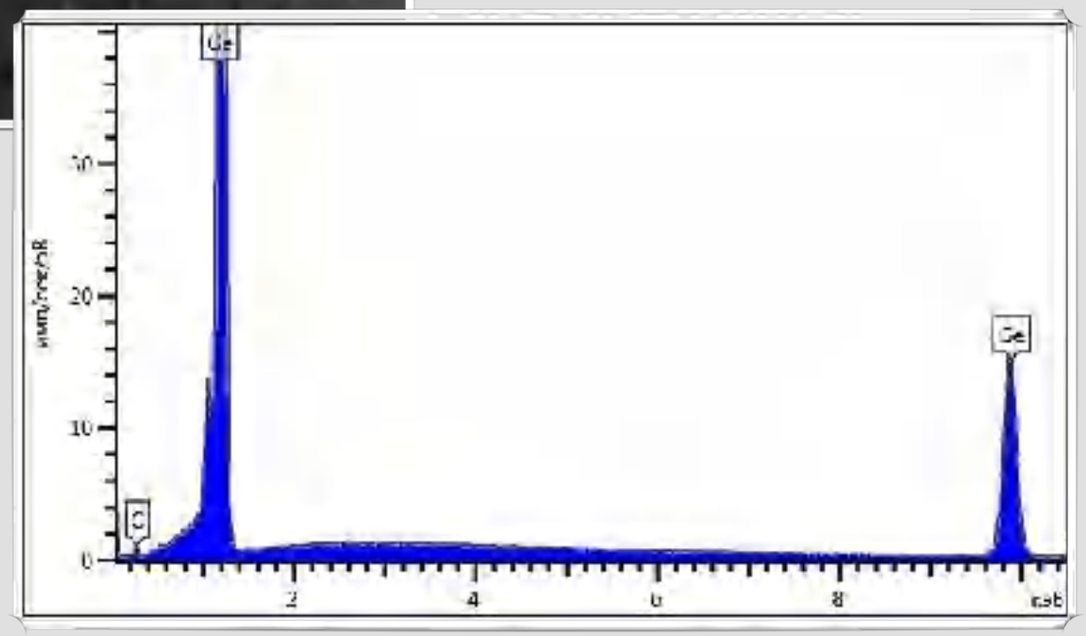

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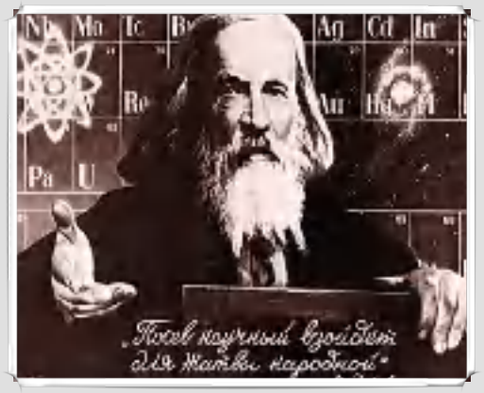

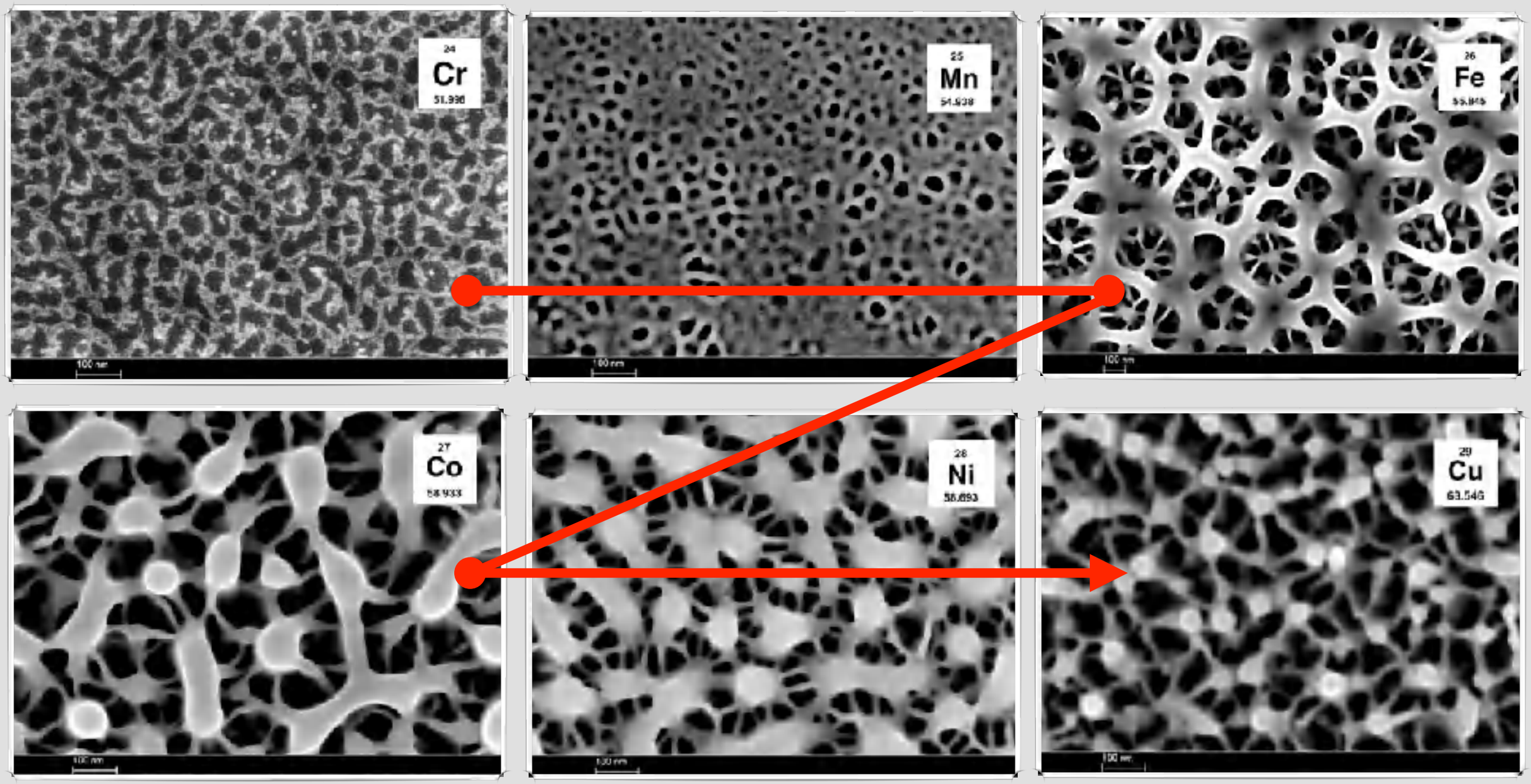

E = 40 кэВ J = 8 мкА/см² D = 5.0 x 10¹⁶ ион/см²

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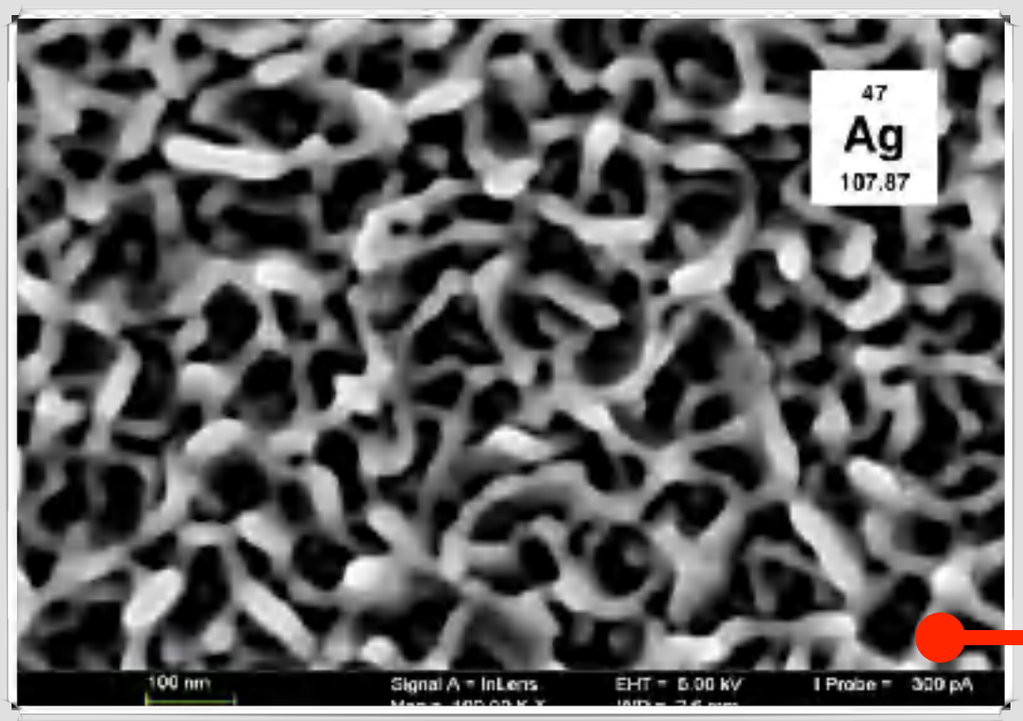
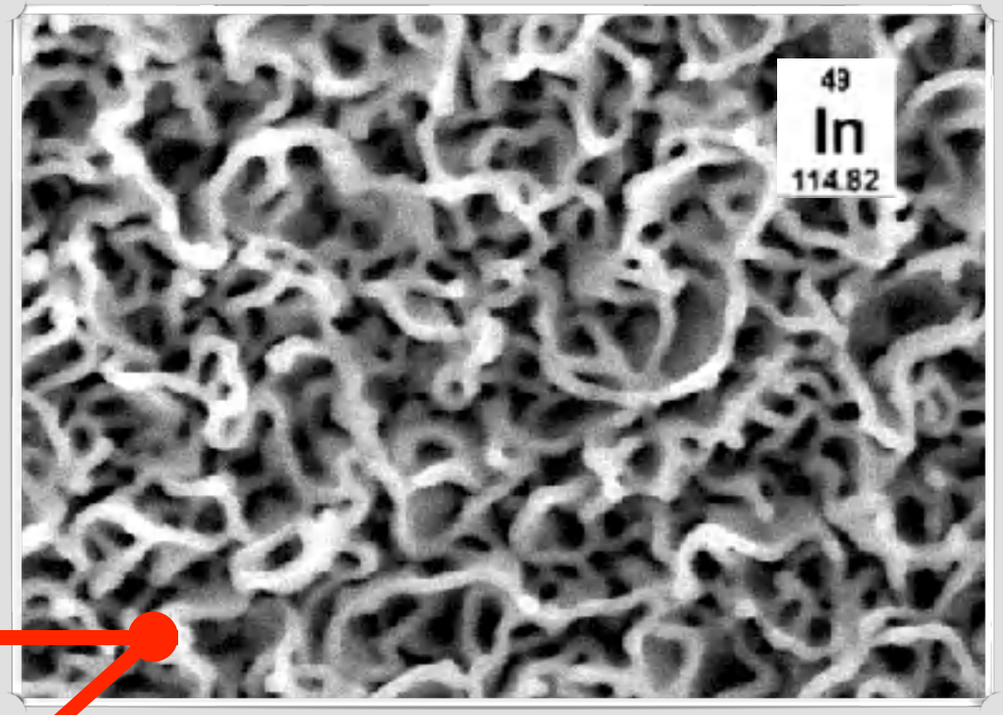
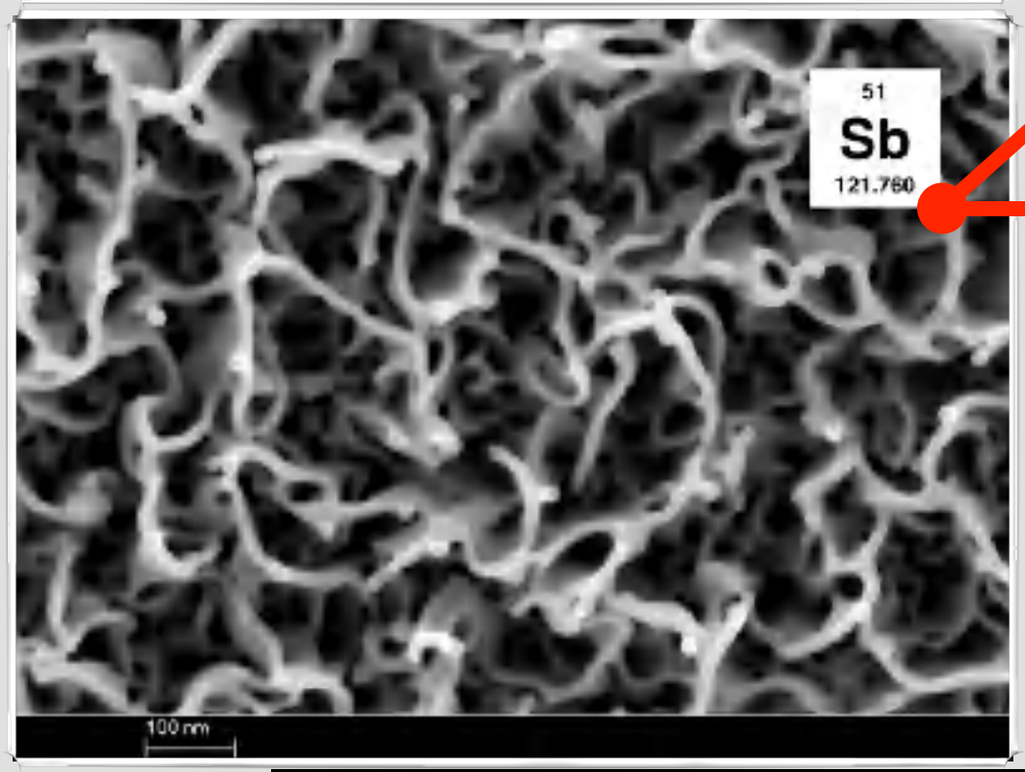
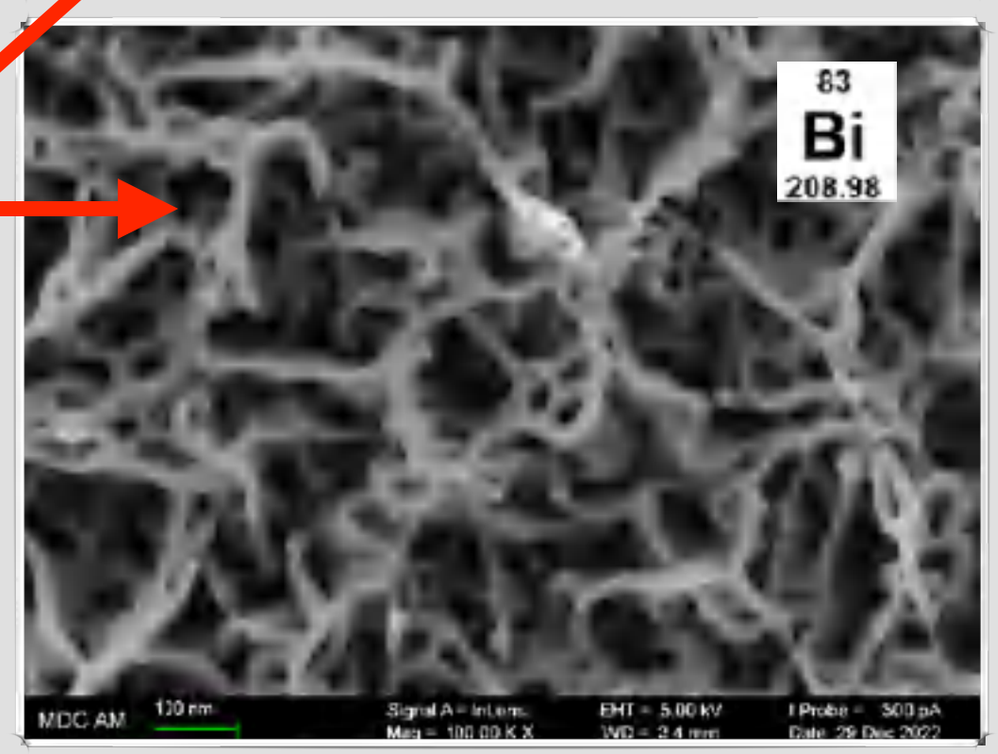


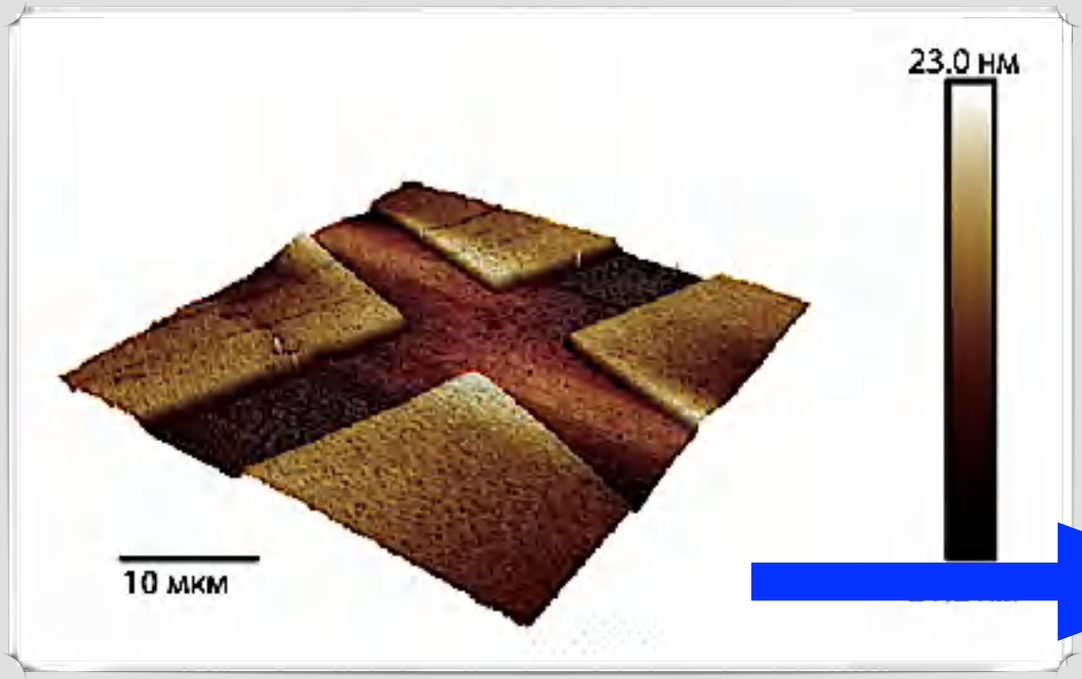


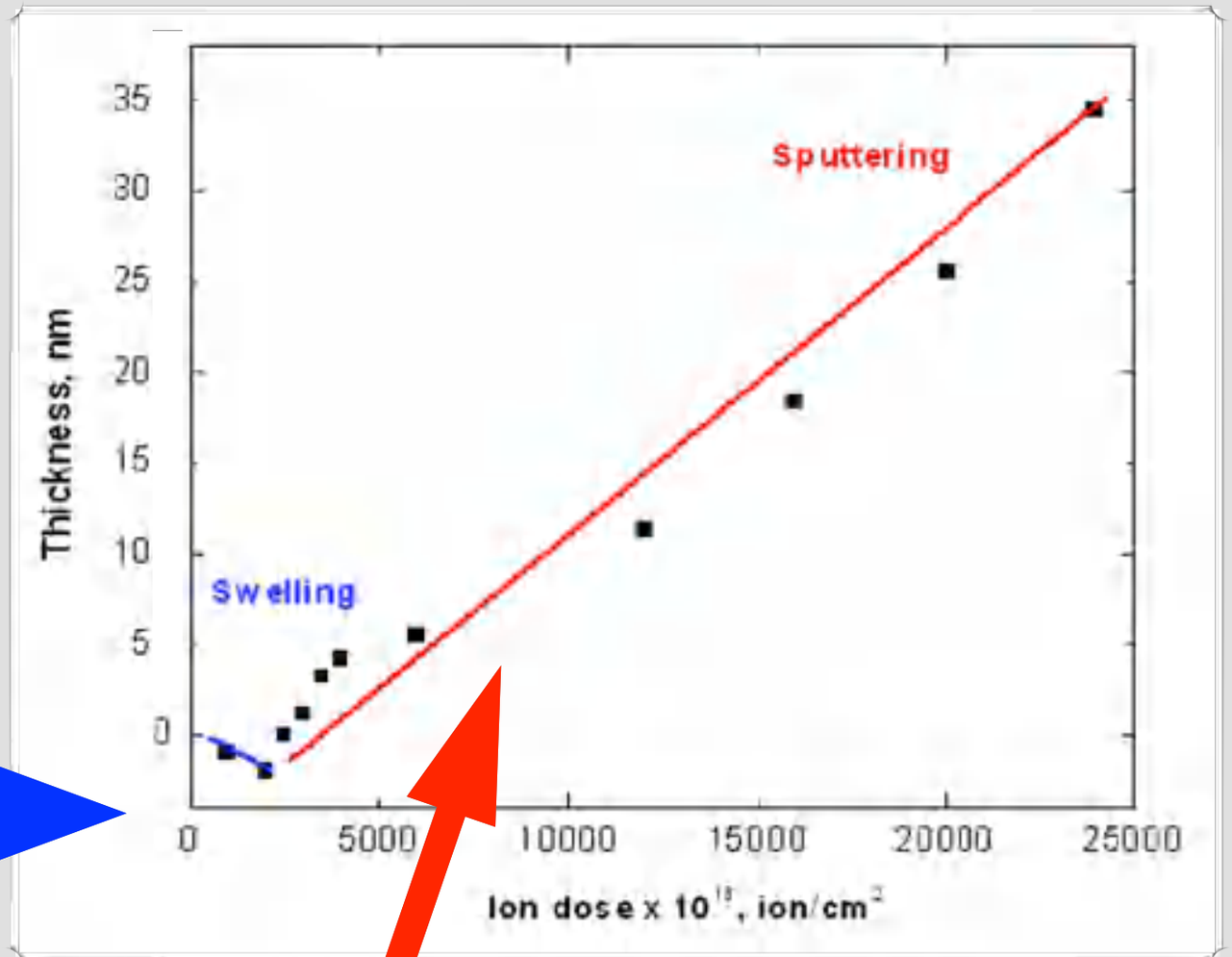


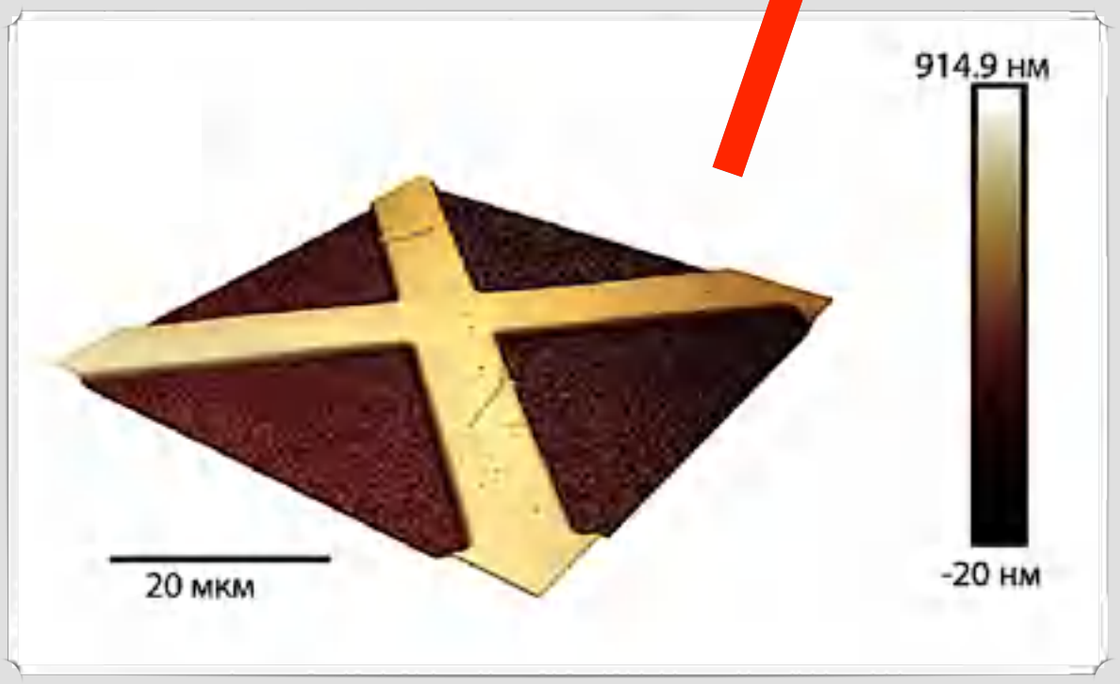


E = 30-35 кэВ J = 5 мкА/см² D = 5.0 x 10¹⁶ ион/см²

ВСПУЧИВАНИЕ ПОВЕРХНОСТИ

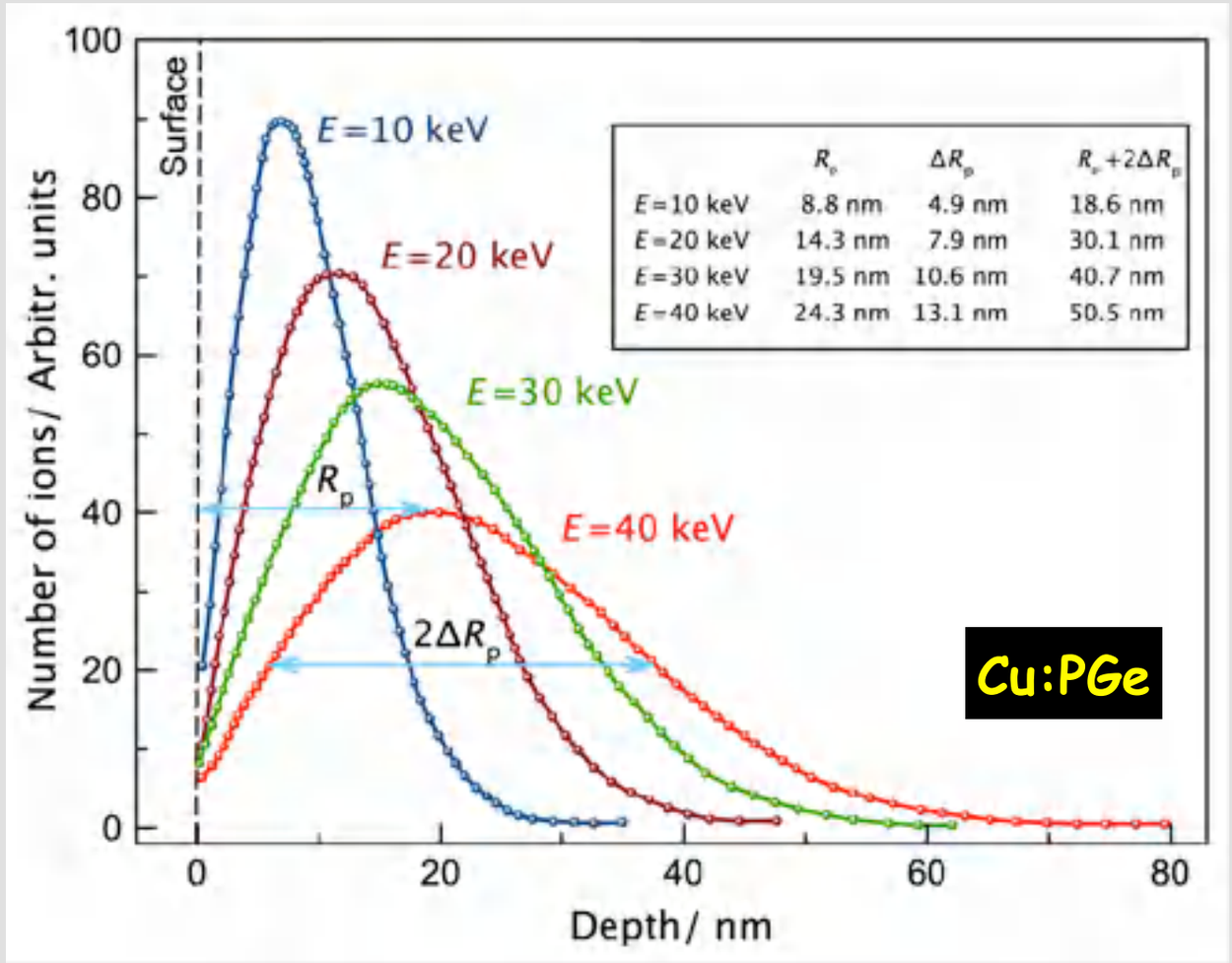






РАСПЫЛЕНИЕ ПОВЕРХНОСТИ

ПРОФИЛИ РАСПРЕДЕЛЕНИЯ ИОНОВ ПО ГЛУБИНЕ ДЛЯ РАЗНЫХ ЭНЕРГИЙ



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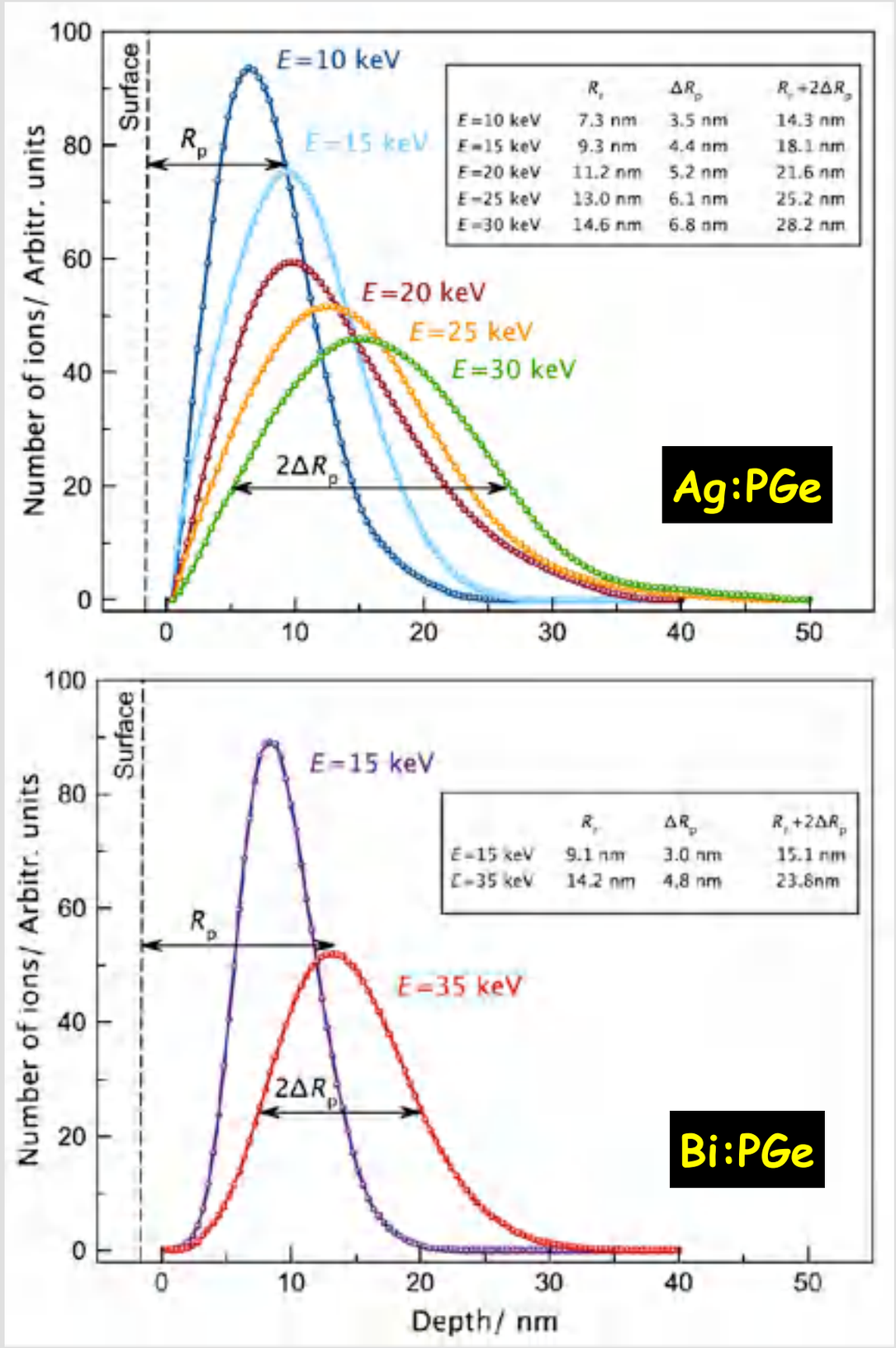
E=10 keV	8.8 nm	4.9 nm	18.6 nm
E=20 keV	14.3 nm	7.9 nm	30.1 nm
E=30 keV	19.5 nm	10.6 nm	40.7 nm
E=40 keV	24.3 nm	13.1 nm	50.5 nm

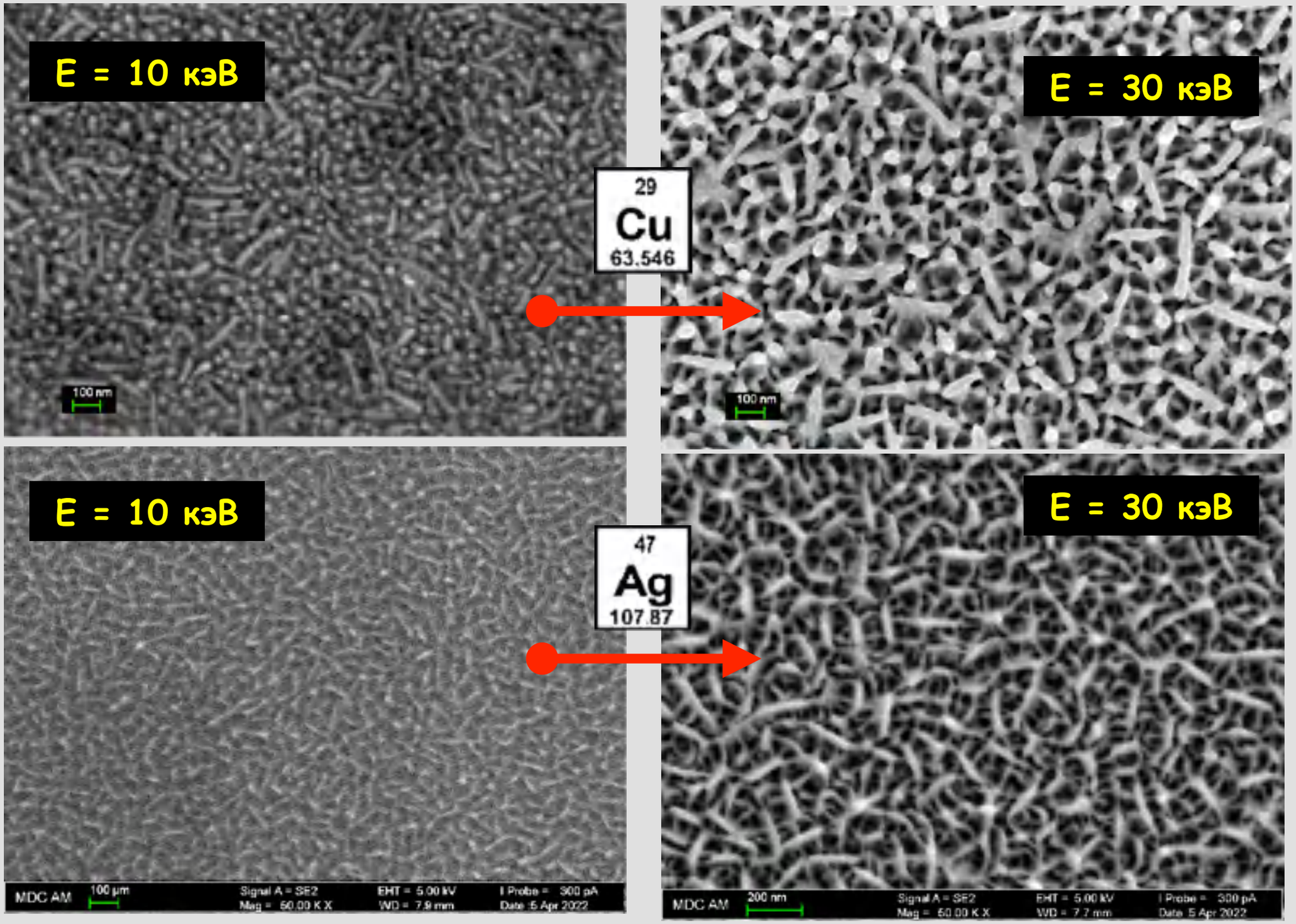
SRIM-2013



	R_p	ΔR_p	$R_p+2\Delta R_p$
E=10 keV	7.3 nm	3.5 nm	14.3 nm
E=15 keV	9.3 nm	4.4 nm	18.1 nm
E=20 keV	11.2 nm	5.2 nm	21.6 nm
E=25 keV	13.0 nm	6.1 nm	25.2 nm
E=30 keV	14.6 nm	6.8 nm	28.2 nm

	R_p	ΔR_p	$R_p+2\Delta R_p$
E=15 keV	9.1 nm	3.0 nm	15.1 nm
E=35 keV	14.2 nm	4.8 nm	23.8nm

ИМПЛАНТАЦИЯ ГЕРМАНИЯ ИОНАМИ МЕТАЛЛОВ С РАЗЛИЧНОЙ ЭНЕРГИЕЙ



$J = 5$ мкА/см^2 $D = 5.0 \times 10^{16}$ ион/см^2

ИМПЛАНТАЦИЯ ГЕРМАНИЯ ИОНАМИ ВИСМУТА С РАЗЛИЧНОЙ ЭНЕРГИЕЙ

83
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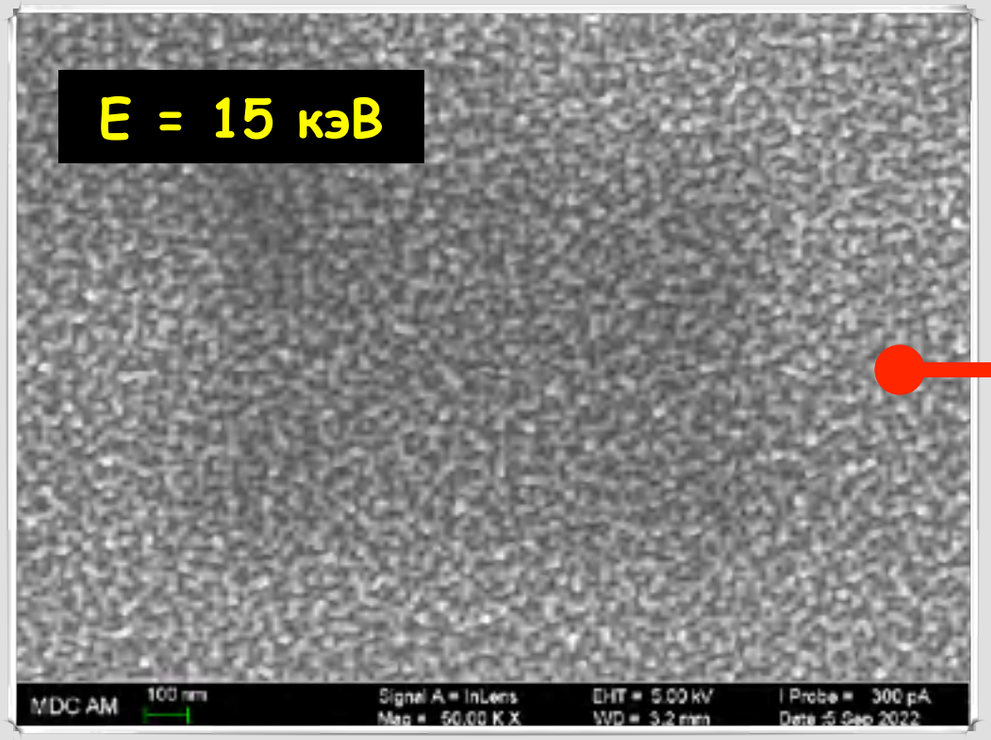
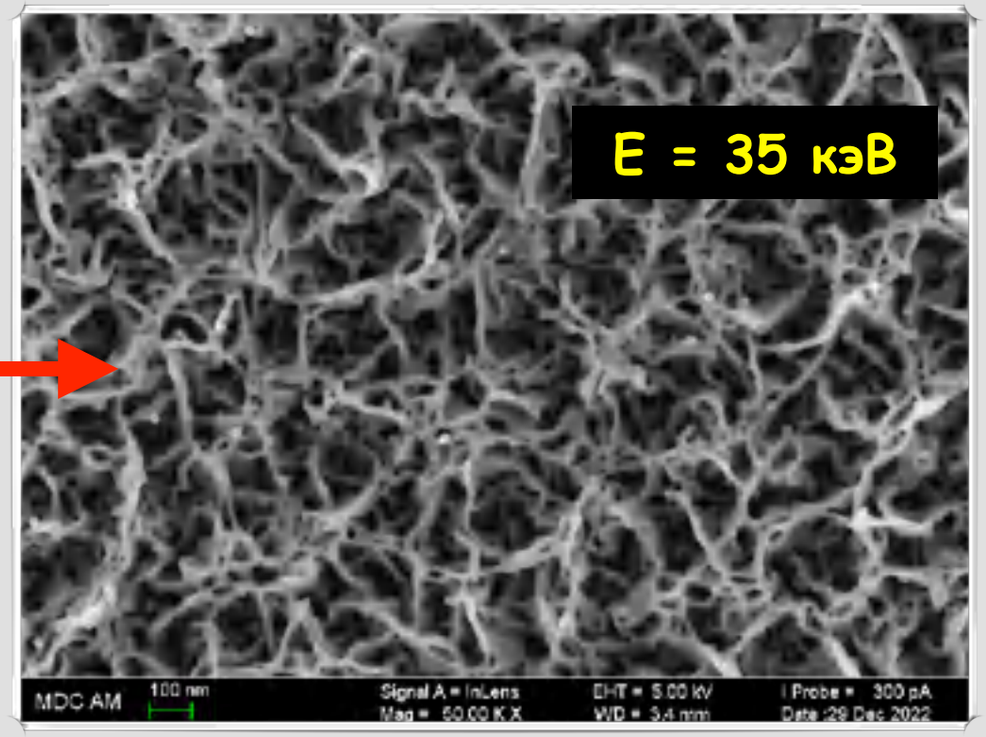
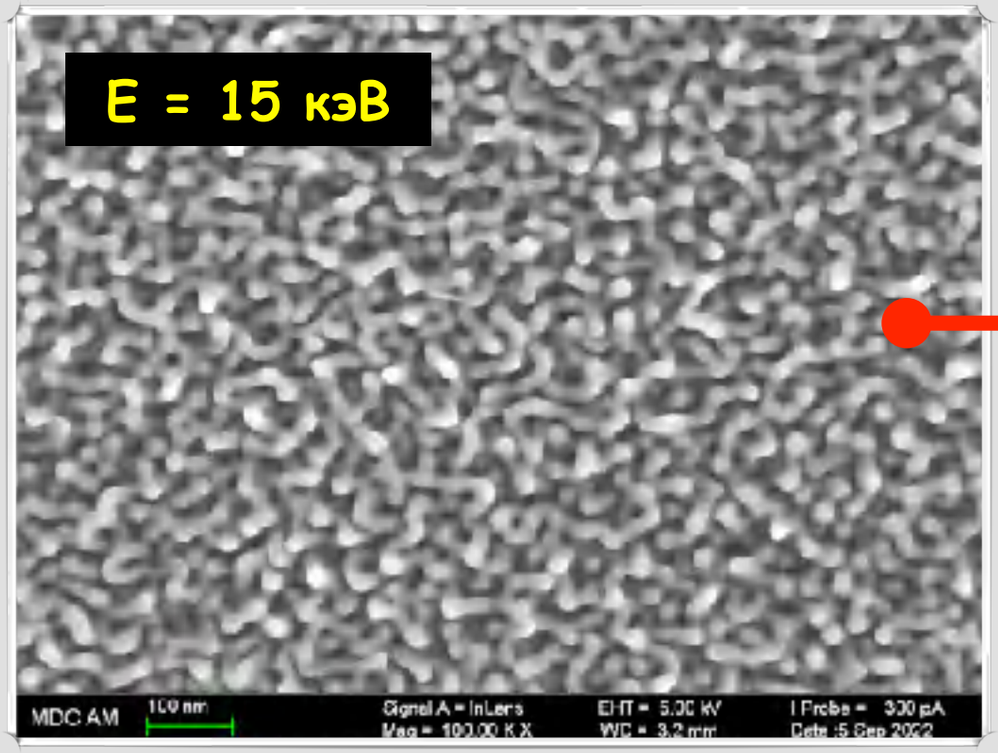
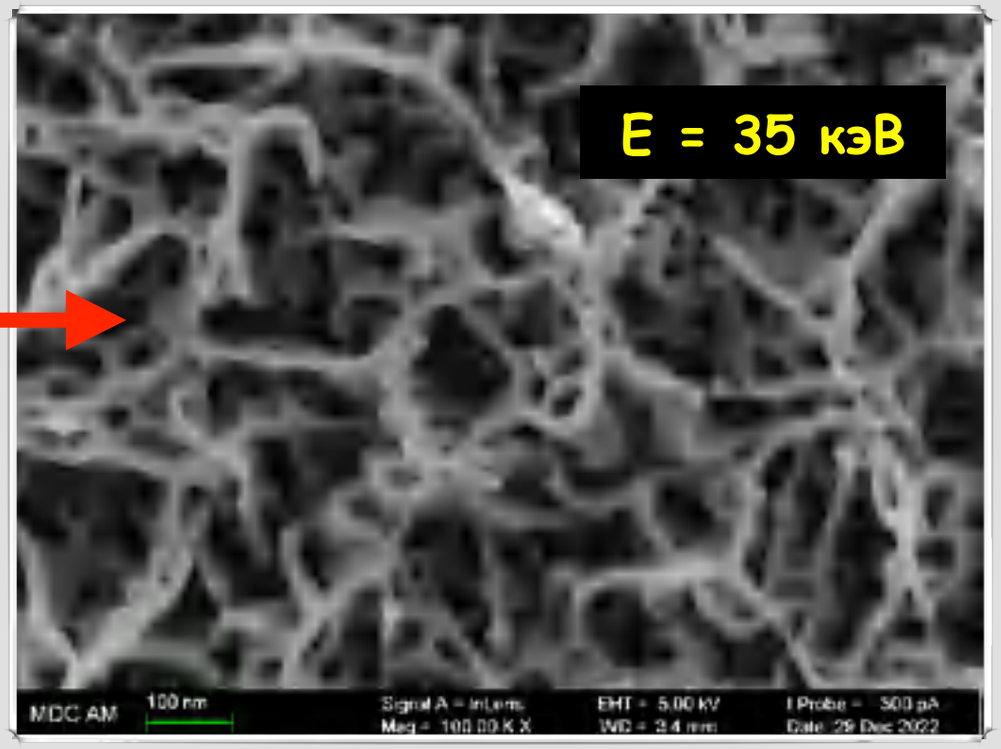
208.98



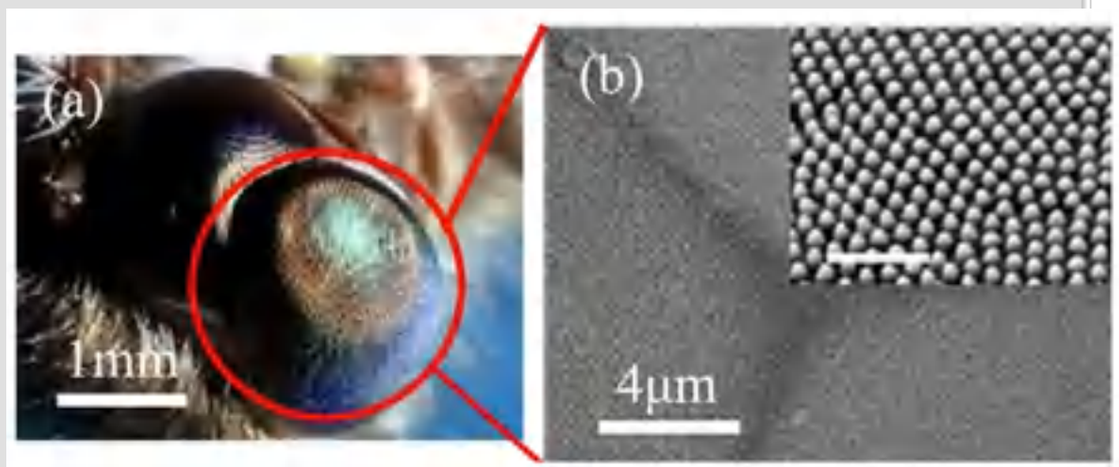


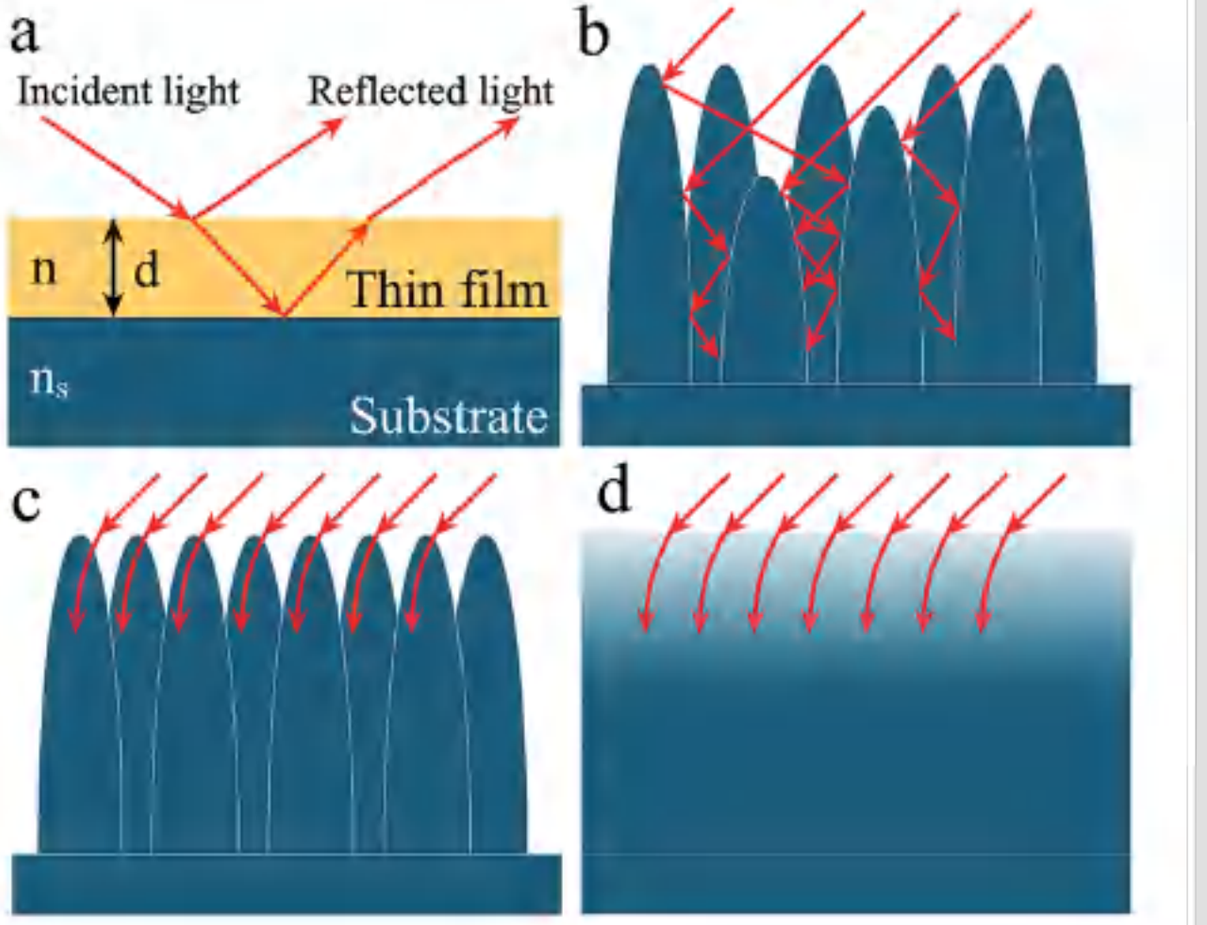




$J = 5$ мкА/см^2 $D = 5.0 \times 10^{16}$ ион/см^2

СПОСОБЫ УМЕНЬШЕНИЯ ОПТИЧЕСКОГО ОТРАЖЕНИЯ





Energy &
Environmental Science

Cite this: *Energy Environ. Sci.*, 2011, **4**, 3779

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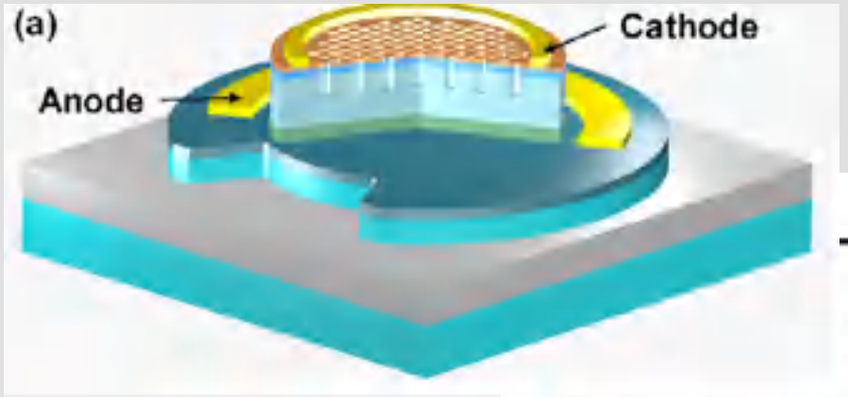
Anti-reflective coatings: A critical, in-depth review

Hemant Kumar Raut,*[a] V. Anand Ganesh,[a] A. Sreekumaran Nair[b] and Seeram Ramakrishna[**]

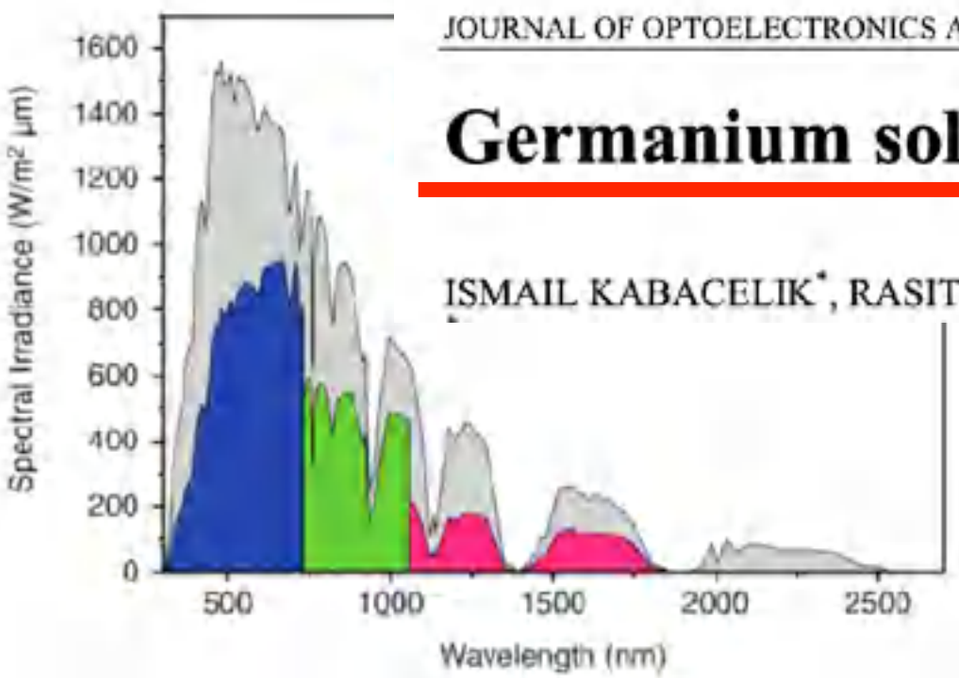
ГЕРМАНИЕВЫЕ ФОТОПРИЕМНИКИ



Nanophotonics 2021; 10(3): 1081–1087

Jinwen Song, Shuai Yuan, Chengcong Cui, Yuxi Wang, Zhiyong Li, Alan X. Wang, Cheng Zeng* and Jinsong Xia*

High-efficiency and high-speed germanium photodetector enabled by multiresonant photonic crystal

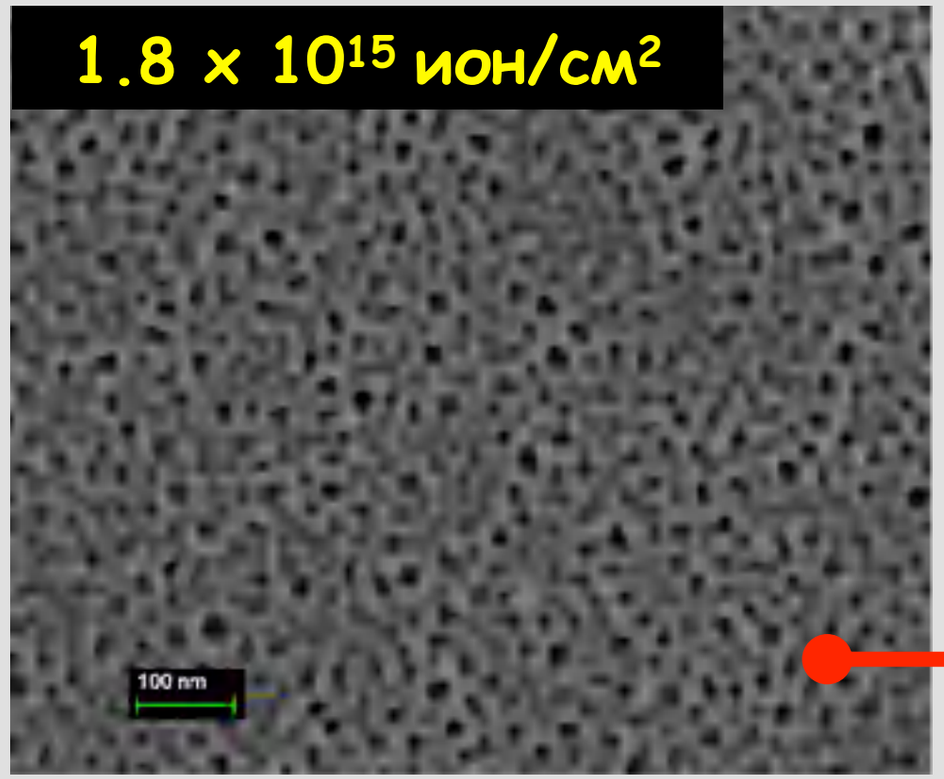


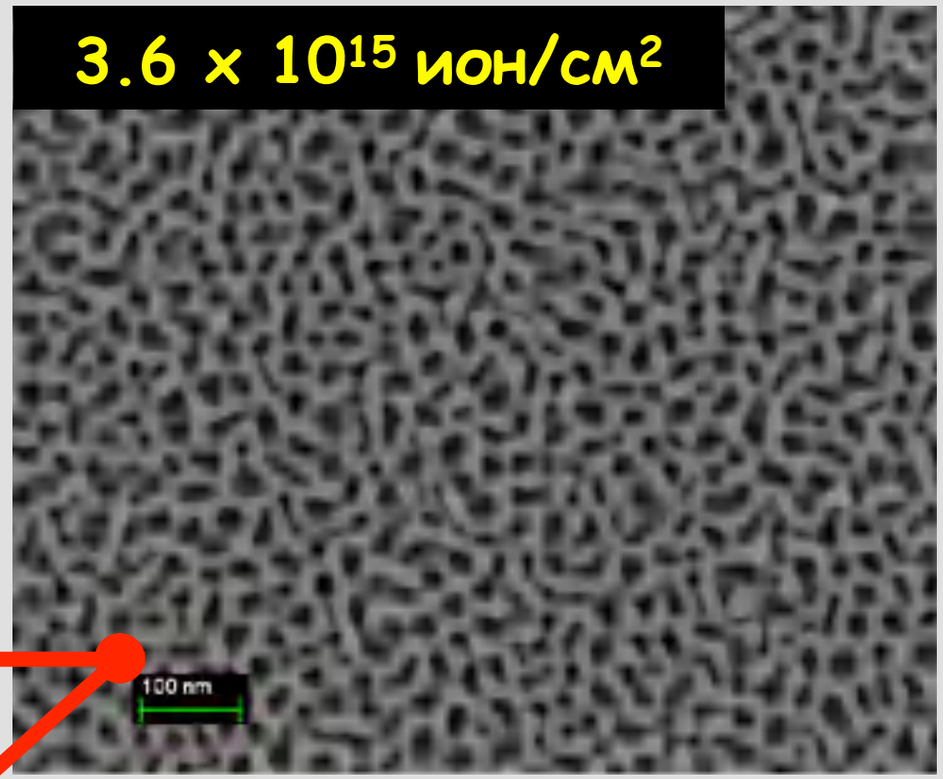
JOURNAL OF OPTOELECTRONICS AND ADVANCED MATERIALS Vol. 15, No. 7- 8, September – October 2013, p

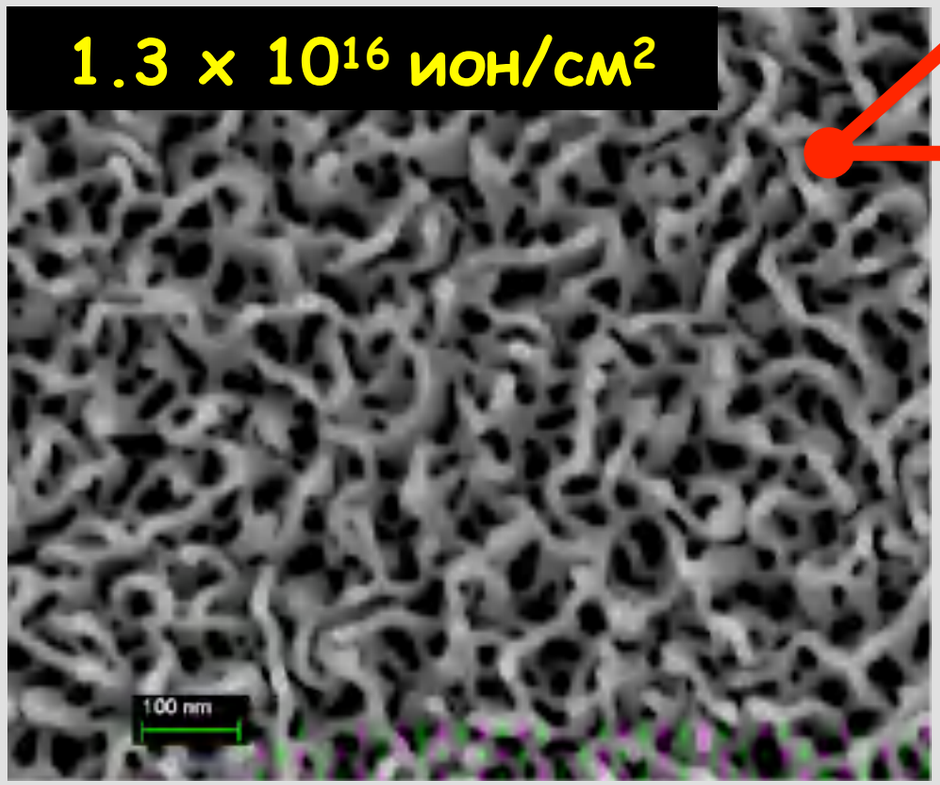
Germanium solar cells prepared by ion implantation

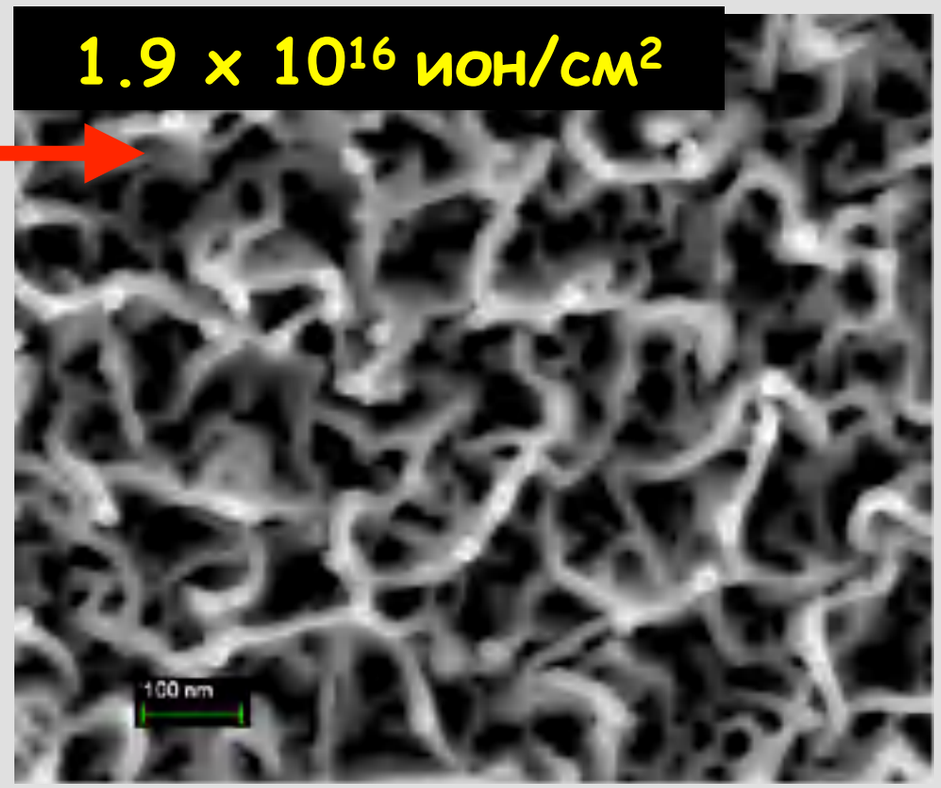
ISMAIL KABACELIK*, RASIT TURAN[a,b,c]

СЭМ ПОВЕРХНОСТИ Ge, ИМПЛАНТИРОВАННОГО ИОНАМИ In^+

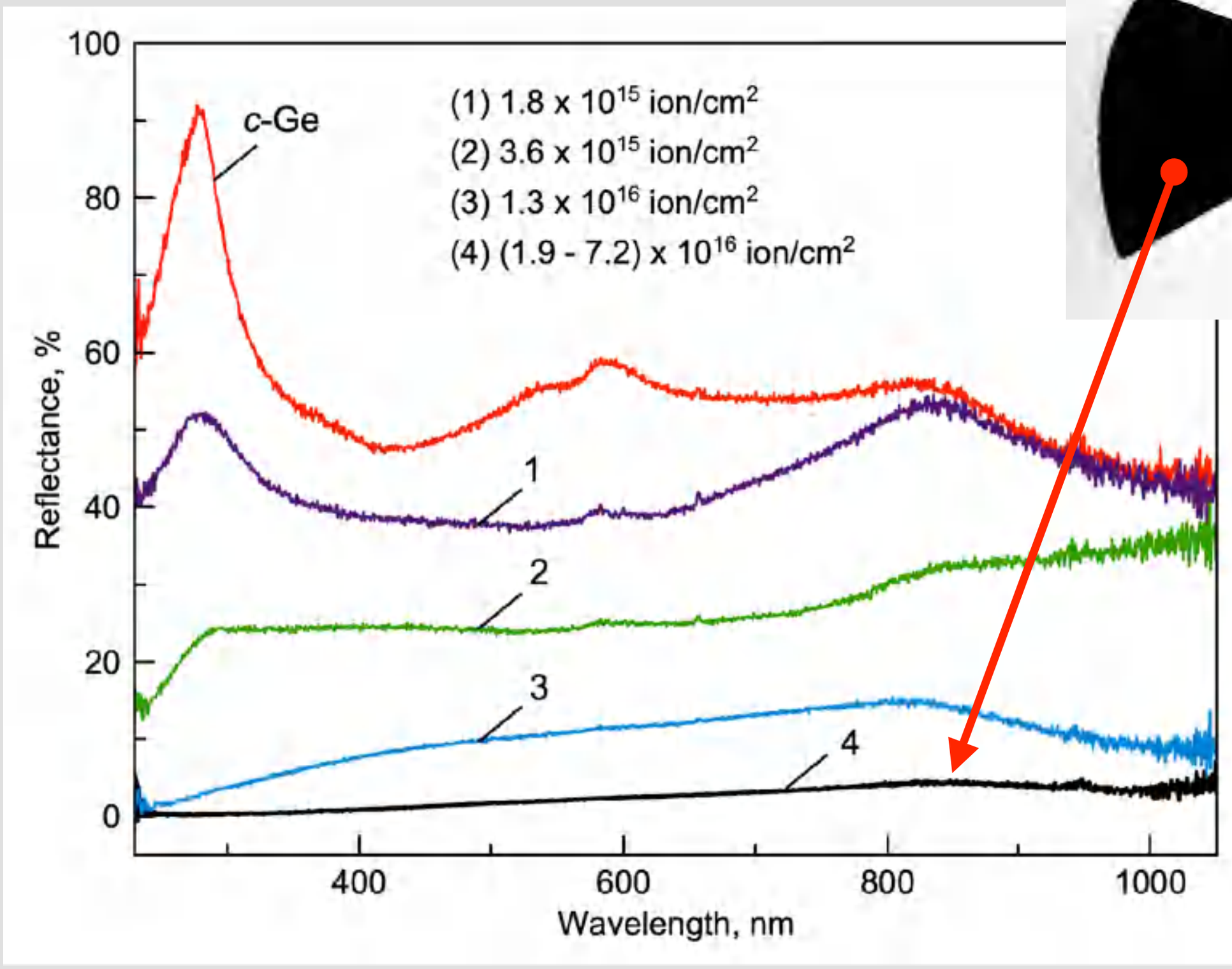


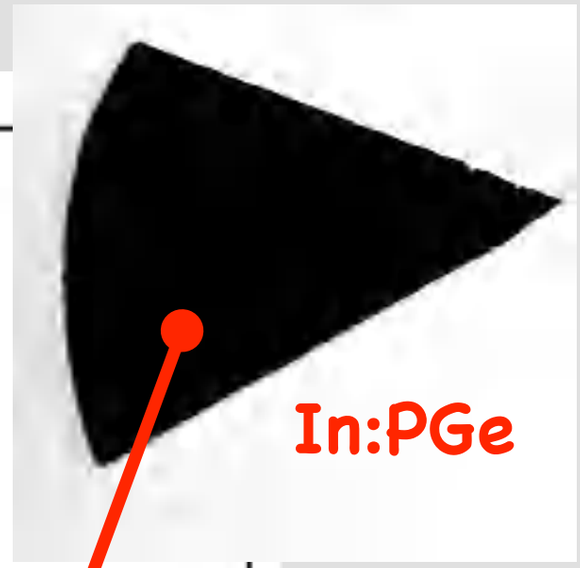




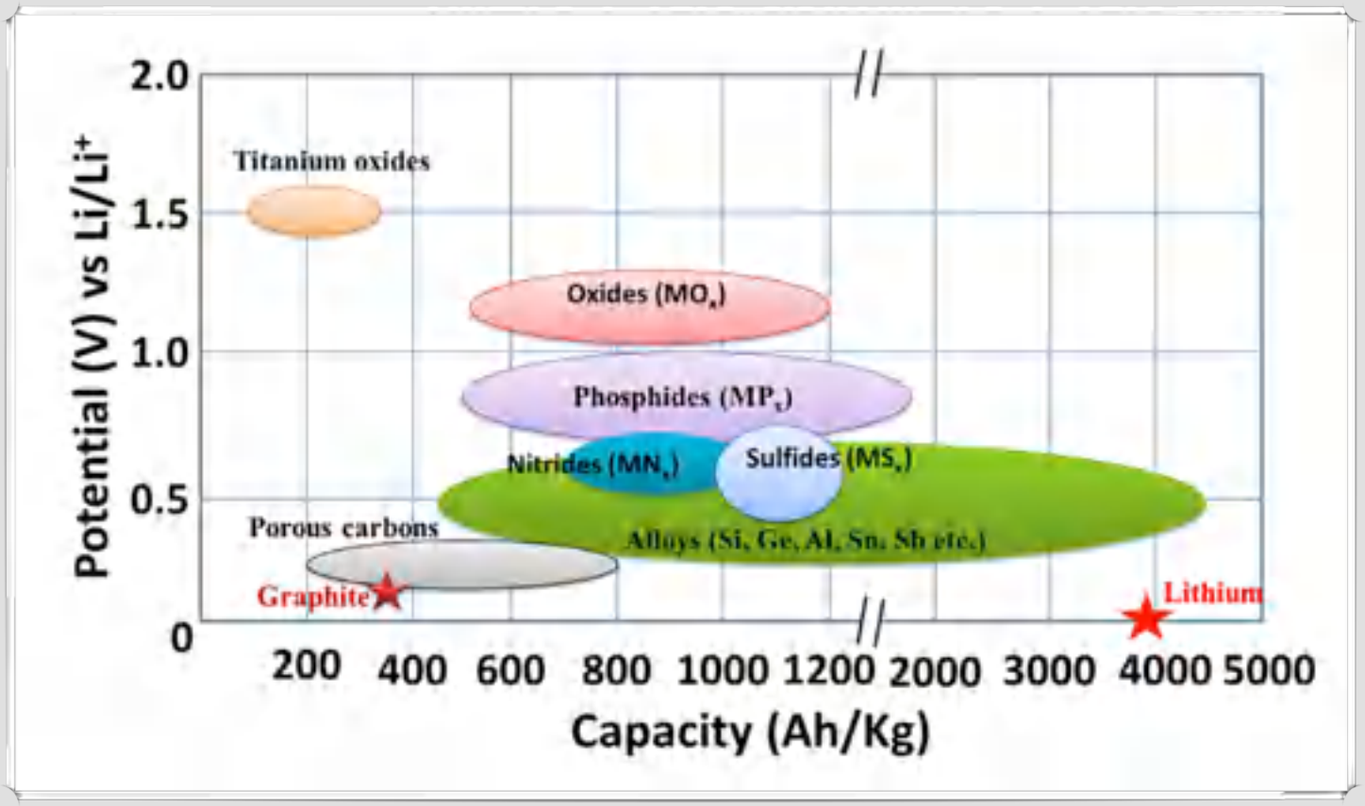


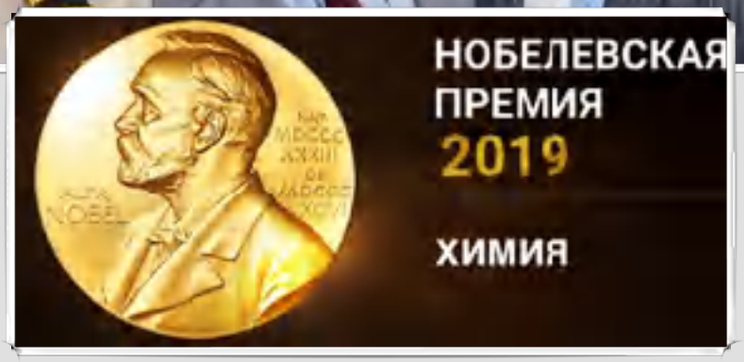
ОПТИЧЕСКОЕ ОТРАЖЕНИЕ Ge, ИМПЛАНТИРОВАННОГО ИОНАМИ In^+ (ЧЕРНЫЙ Ge)

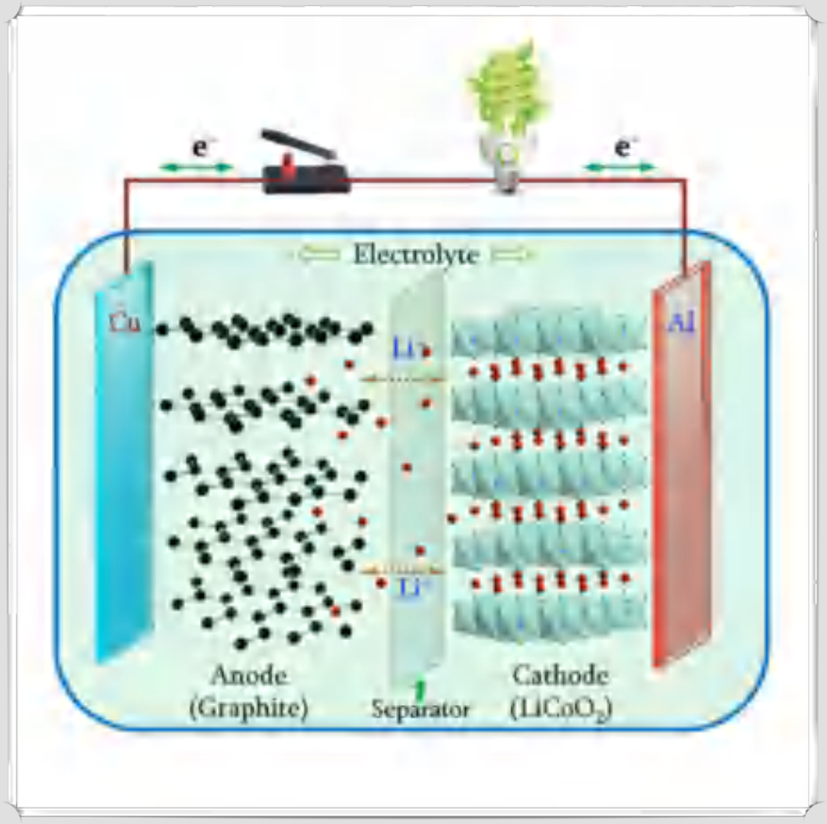




АНОДЫ ЛИТИЙ-ИОННЫХ БАТАРЕЙ







Nano Energy (2015) 13, 651–657

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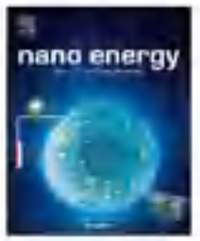
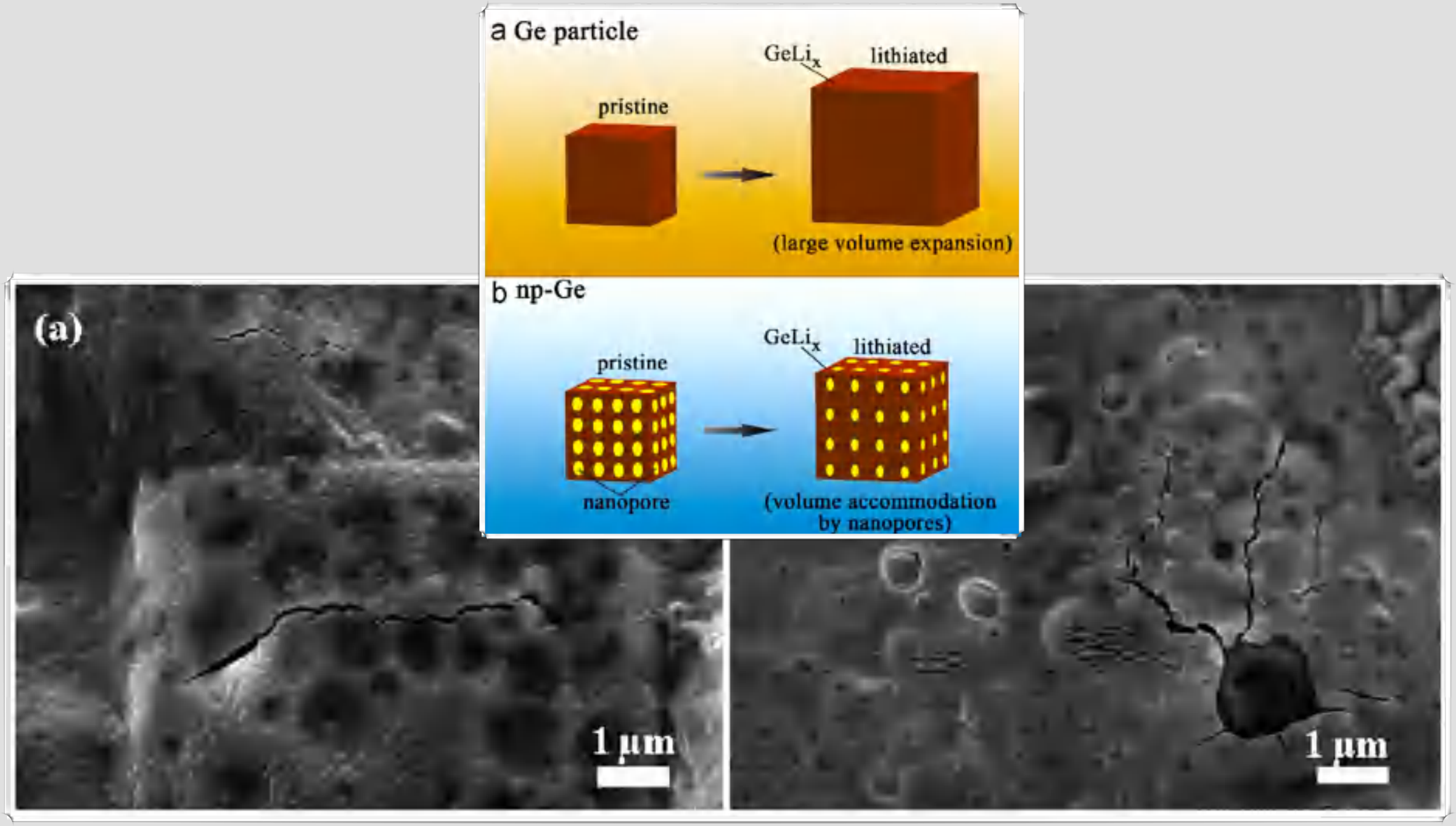


RAPID COMMUNICATION

Nanoporous germanium as high-capacity lithium-ion battery anode

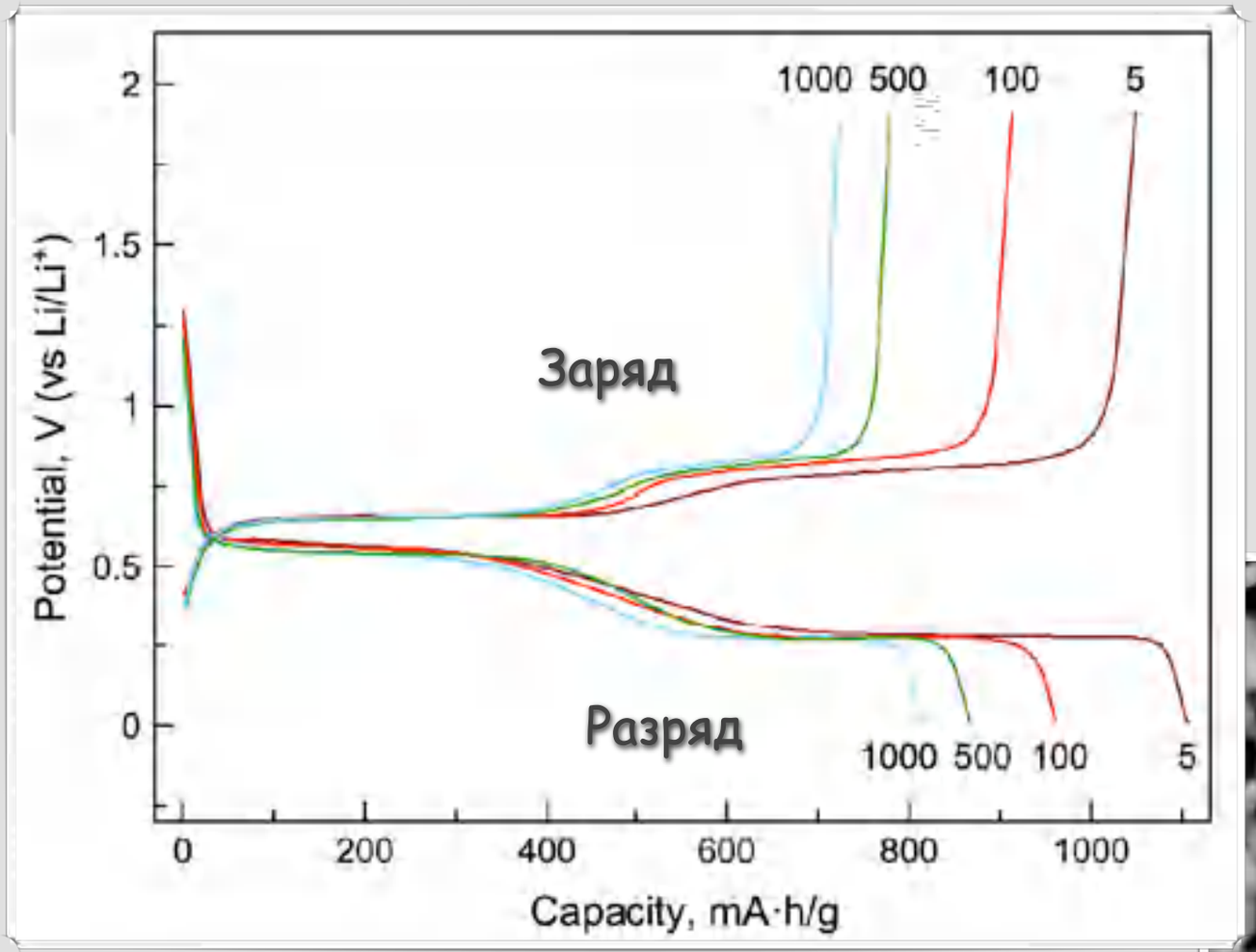
Shuai Liu[a], Jinkui Feng[a,*], Xiufang Bian[a,*], Yitai Qian[b], Jie Liu[c], Hui Xu[a]

МЕХАНИЧЕСКОЕ РАЗРУШЕНИЕ КРИСТАЛЛИЧЕСКОГО ГЕРМАНИЯ ПРИ ИЗМЕНЕНИИ ОБЪЕМА В ПРОЦЕССЕ ЗАРЯДКИ/РАЗРЯДКИ АККУМУЛЯТОРА

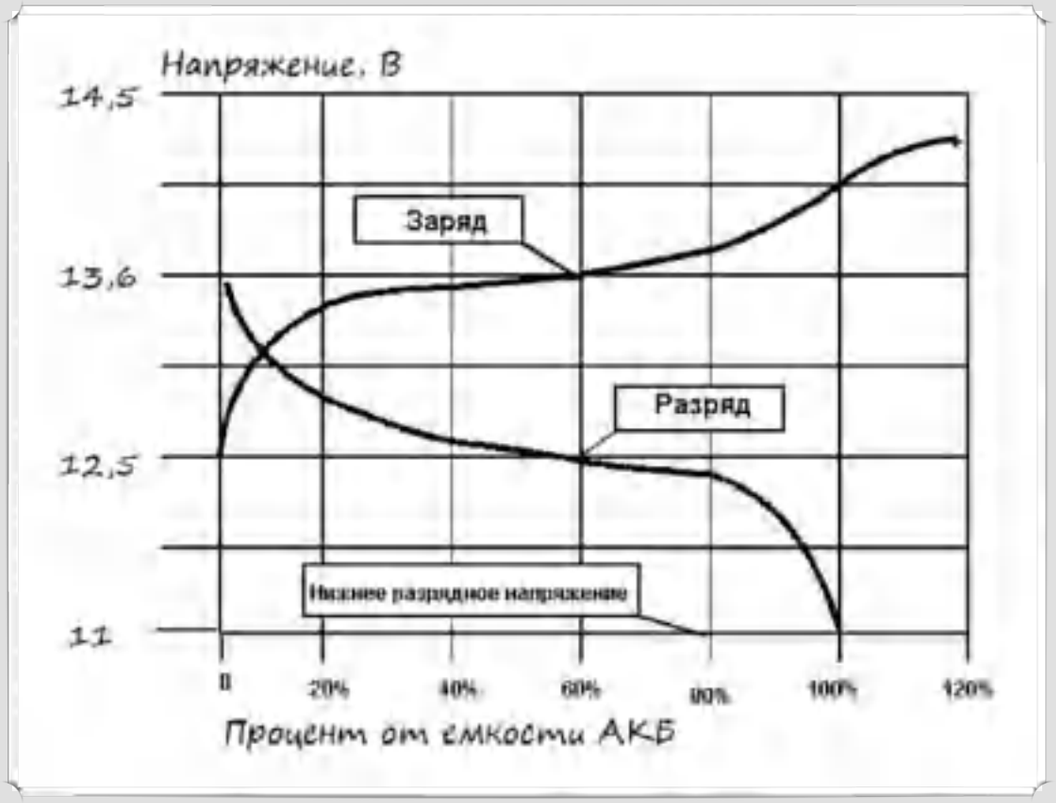


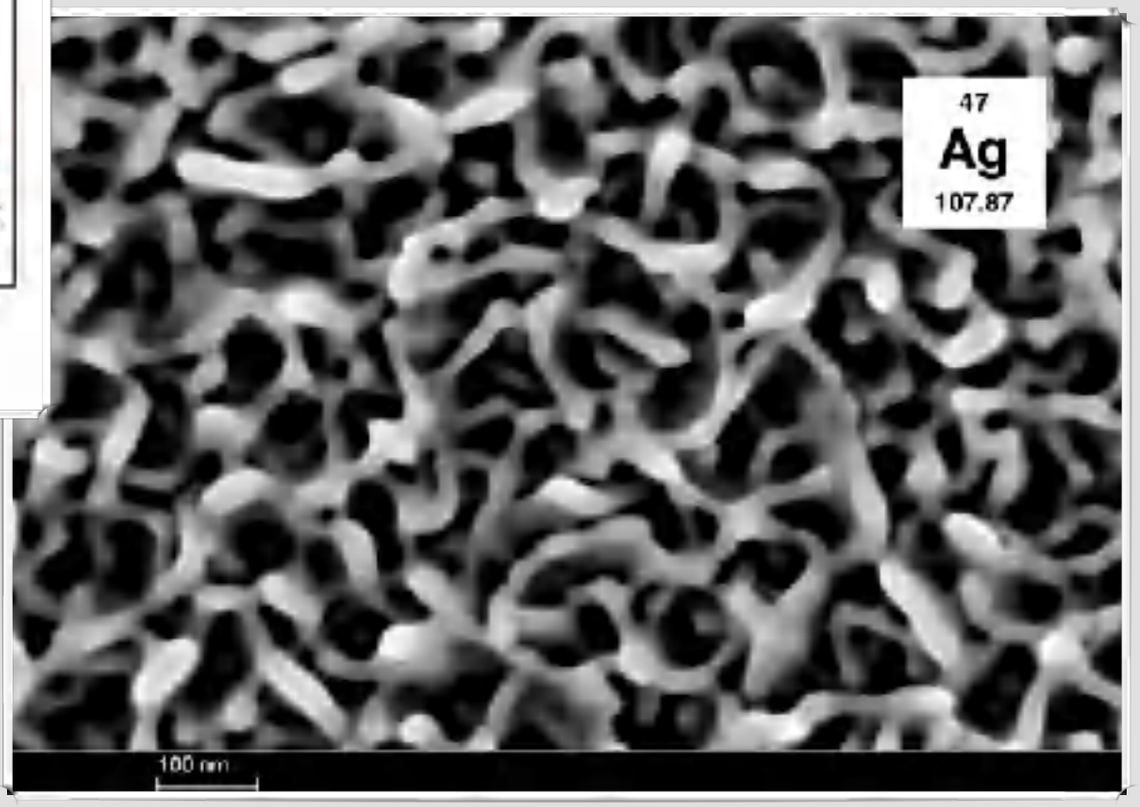
J Mater Sci 2021

ЭЛЕКТРОХИМИЧЕСКИЕ ИЗМЕРЕНИЯ Ag:PGe

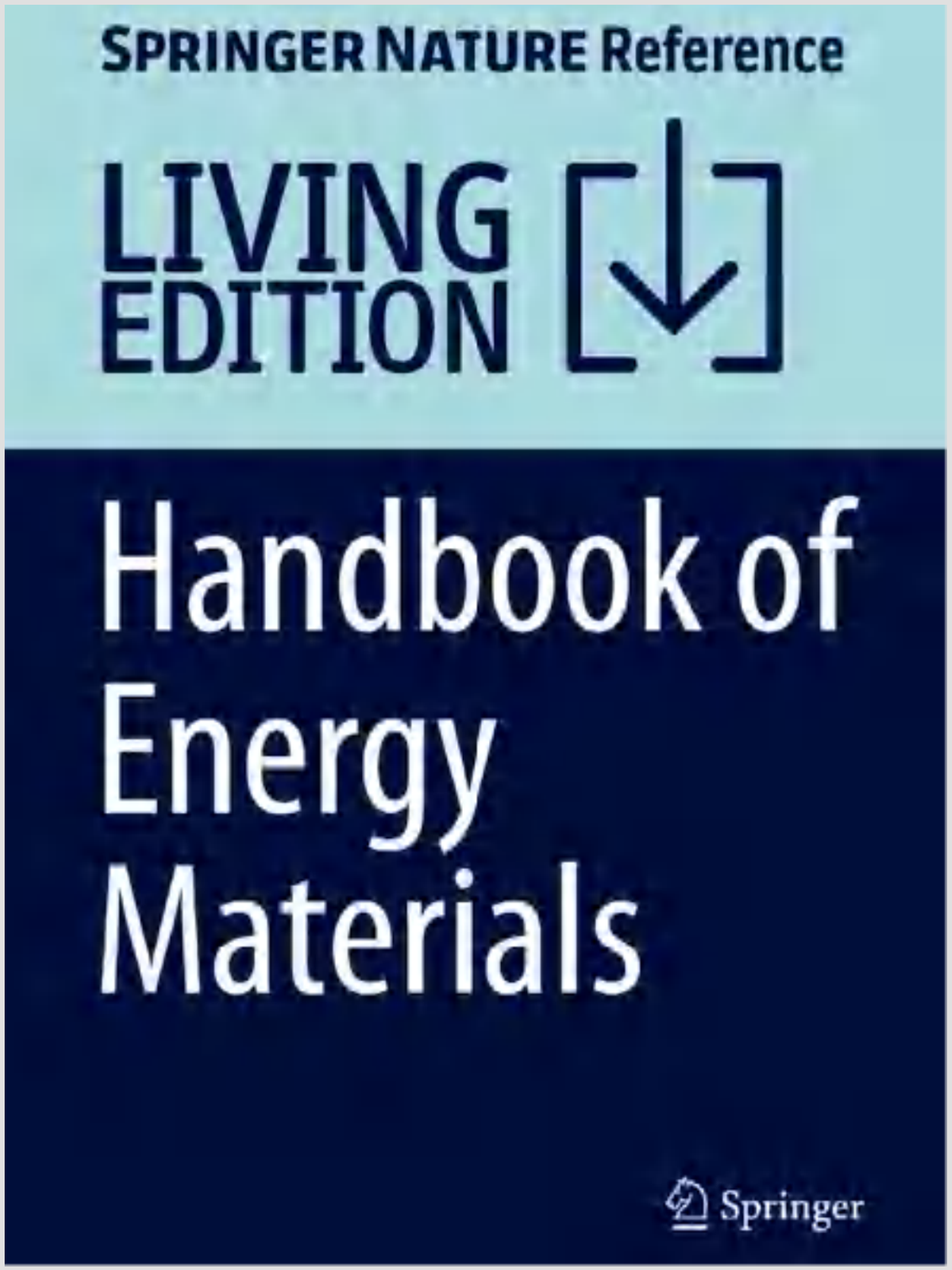


Гальвано-статистические кривые
Литирование/делитирование





Патент РФ на изобретение 2023



Ion Beam Implantation Technology for Production of Thin Nanoporous Ge Layers Suited for Li-Ion Batteries

Andrey L. Stepanov and Sergey M. Khantimerov

Contents

Abstract

In the industry for the development of rechargeable Li-ion battery electrodes, thin nanoporous Ge (PGe) layers as a promising material were increasingly considered. Various technological approaches were used to form PGe. Of particular interest is the effective clean technique for creating PGe layers on the monocrystalline or amorphous Ge substrates by high-dose ion implantation. This chapter presents a literature review for recent years on the synthesis of PGe layers formed by ion implantation. The summarized data on the parameters of implantation, such as acceleration energy, type of ion, dose, current density, matrix temperature, and annealing conditions, are presented. Additionally, recent original experiments on the creation of nanoporous Ge layers doped with various metal ions and nanoparticles by implantation of low-energy and high doses of ions are discussed. Changes in the morphology of implanted Ge surfaces were analyzed by scanning electron and atomic force microscopy. The near-surface layer of the samples was also studied using backscattered electron diffraction and energy-dispersive X-ray microanalysis. Thus, ion implantation is proposed, illustrated, and discussed to be applied to form thin layers of nanoporous semiconductors for the Li-ion battey

A. L. Stepanov (✉) · S. M. Khantimerov
Zavoisky Physical-Technical Institute, FRC Kazan Scientific Center, Russian Academy of Sciences, Kazan, Russia

R. Gupta, (ed.), *Handbook of Energy Materials*,
https://doi.org/10.1007/978-981-16-4480-1_64-1

aanstep@gmail.com

Андрей Львович
Степанов

РНФ № 17-12-01176

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