Preparation and characterization of the carbon-silicon hybrid nanostructures

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Nanohybrides 18

La Marana, Bastia 30 May- 2 June 2022

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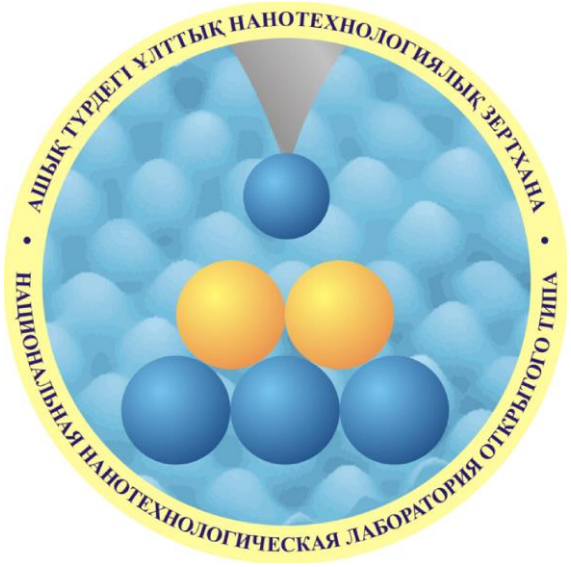
National Nanotechnological Laboratory of Open Type



Silicon nanostructures and their applications:

- Silicon nanowires as an antireflection coating for crystalline silicon solar cells,
- Nanocomposite up-converter coatings for silicon solar cells,
- Semiconductor-insulator-semiconductor solar cells,
- Silicon nanowires for hydrogen generation,
- Silicon nanowires for thermoelectrically energy conversion,
- Silicon nanostructures for biomedical applications.

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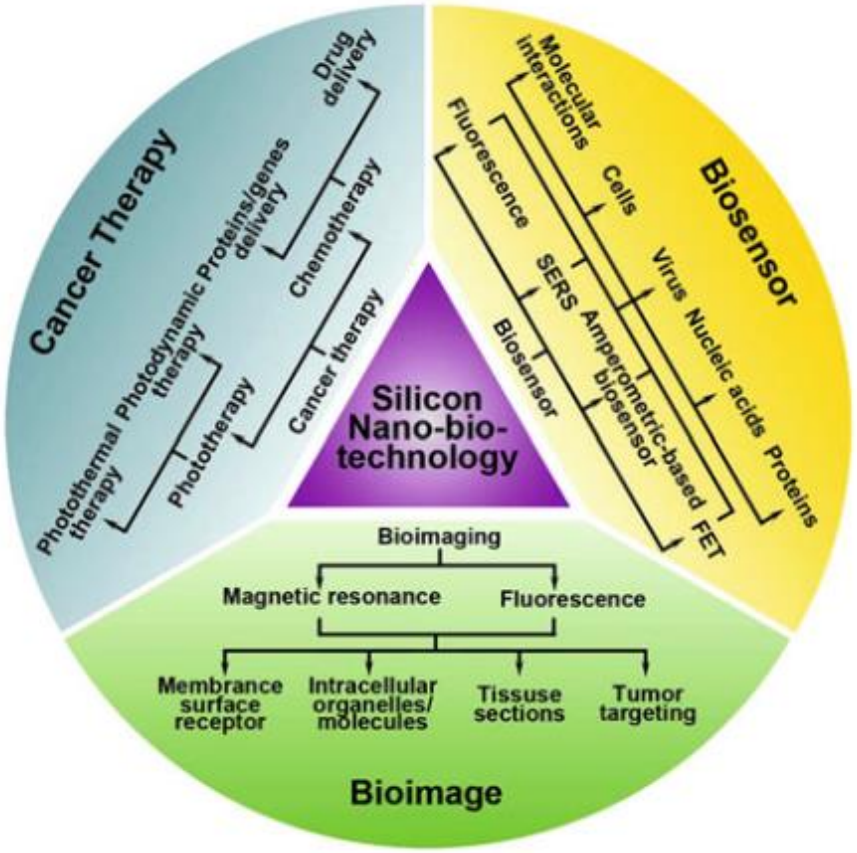

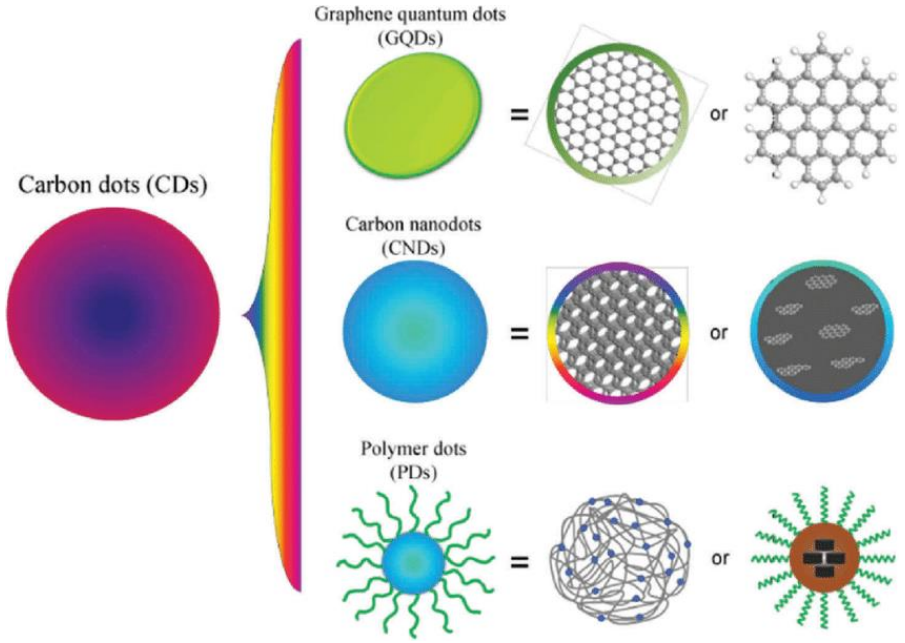

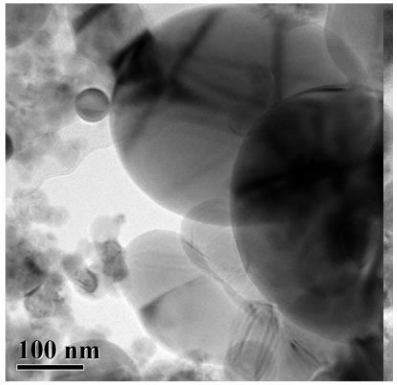

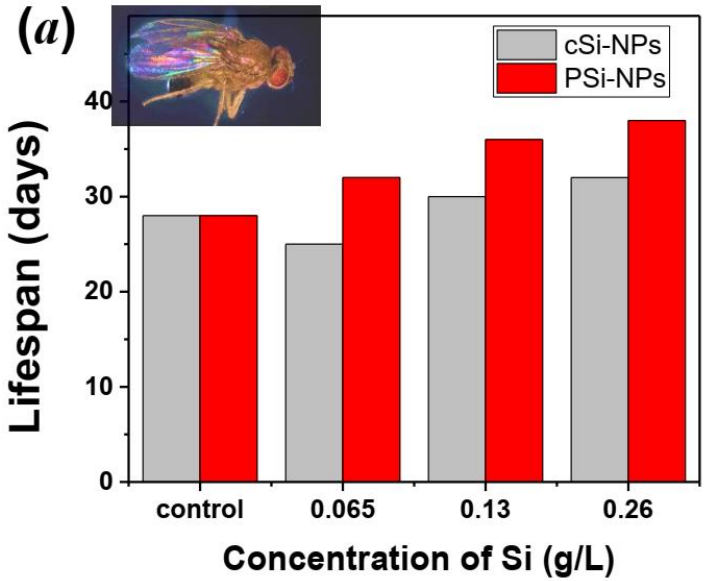

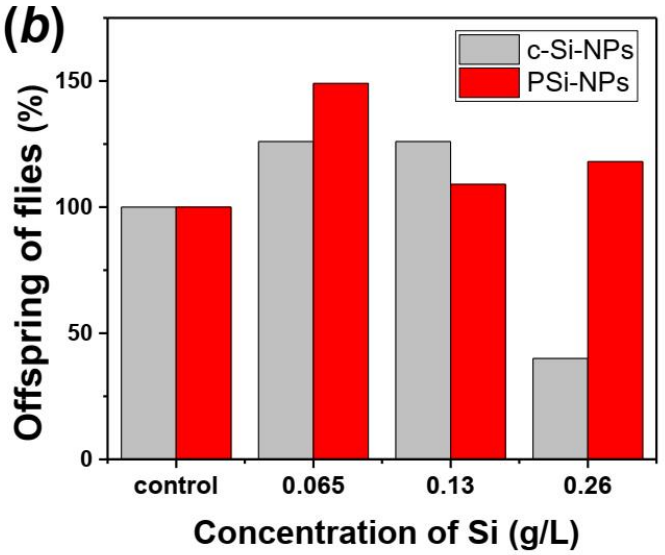

Figure 2: (a) Lifespan and (b) offspring of Vestigial Drosophila flies for different concentration of cSi- and PSi-NPs in feeding media. Inset in panel (a) shows a digital image of the fly.

Synthesis of Si@C nanohybrids

Silumin alloy (80%Al–20% Si)

1. 15% HCl solution for 8 h
2. Washed
3. Filtered

} several times

4. Dried at 120 °C.

oxidized surface of silicon NPs subjected to further carbonization

100 mg Si NPs was treated with polyvinyl pyrrolidone solution (1 g) in absolute ethanol (100 ml)

calcined at 400 °C and 500 °C in an argon atmosphere for 4 hours

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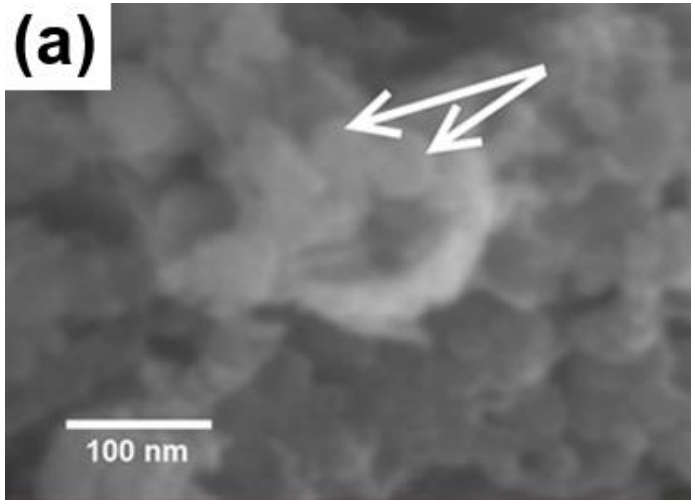
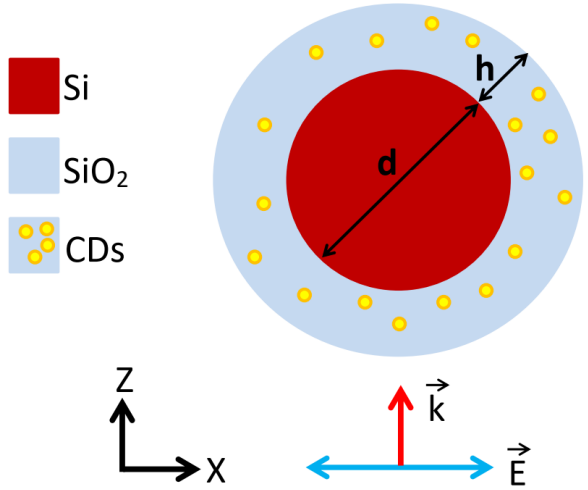
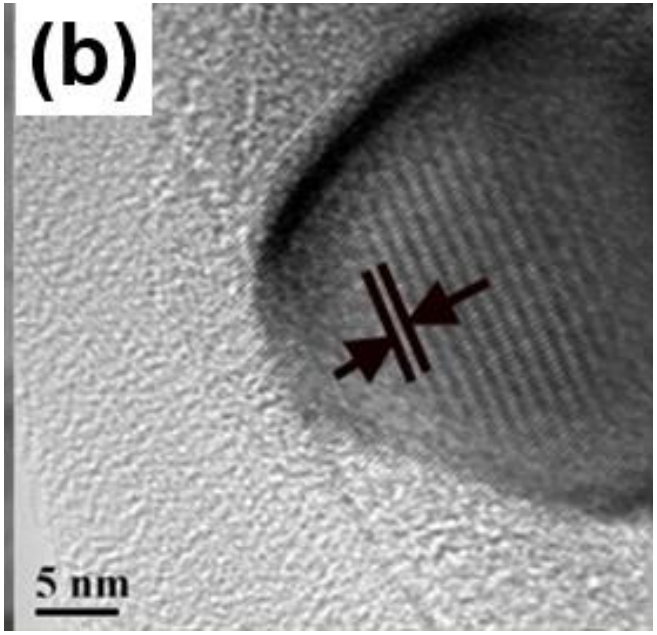
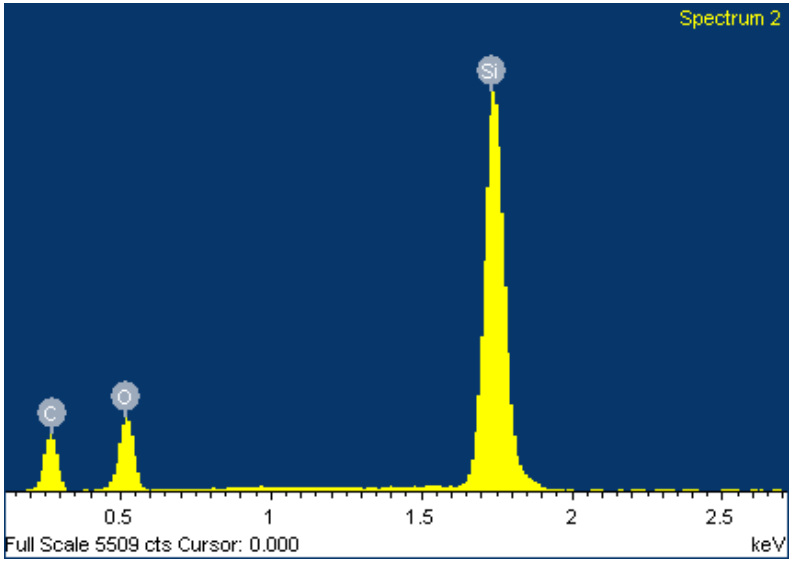
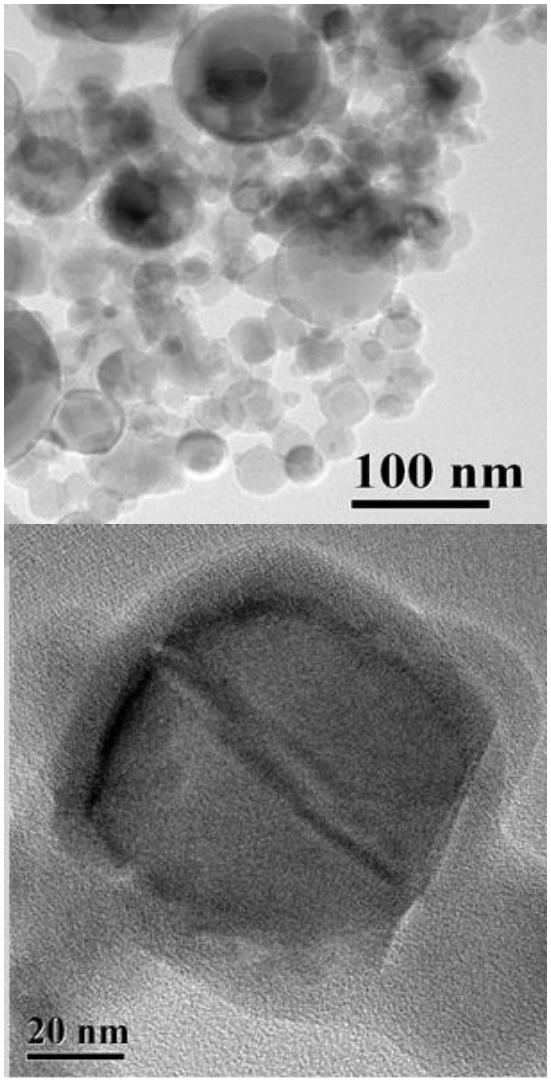
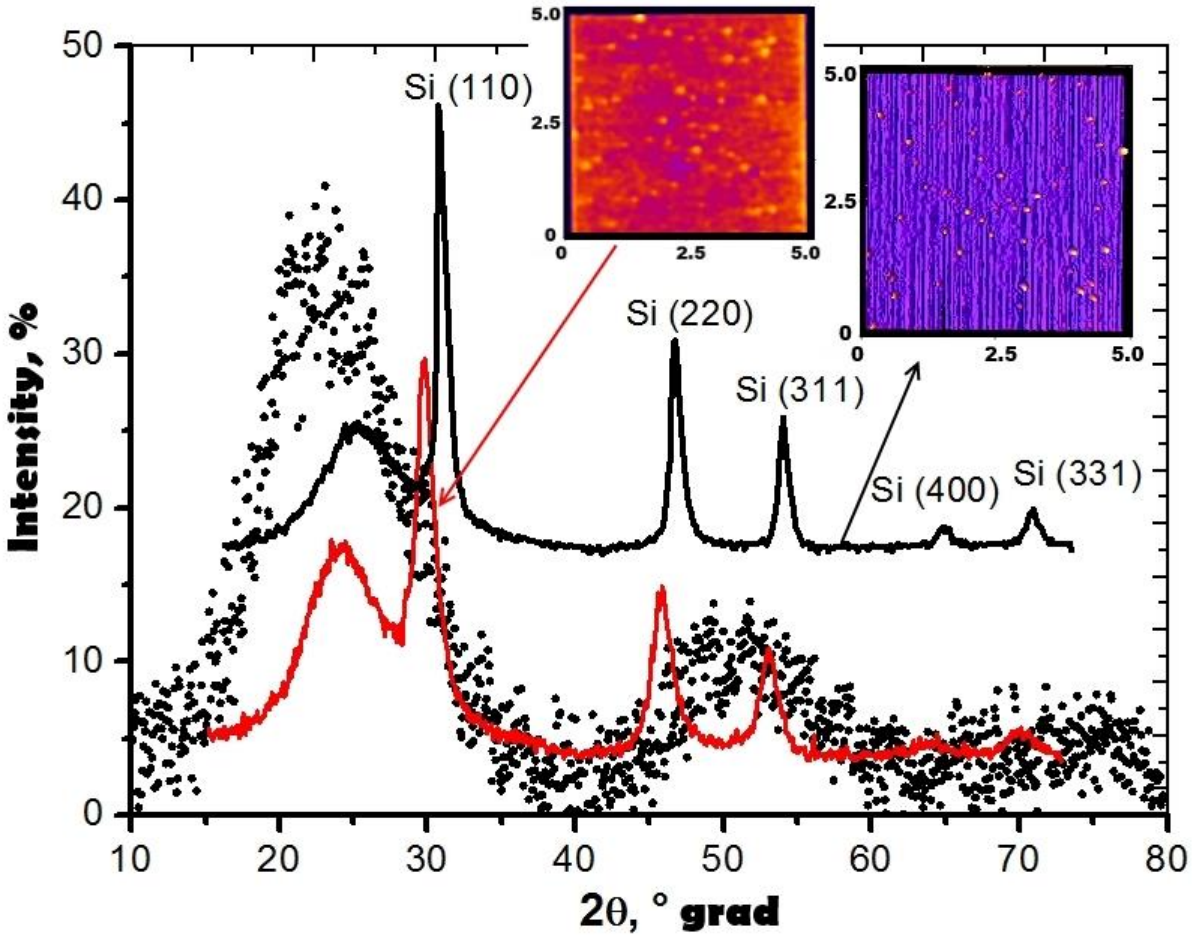




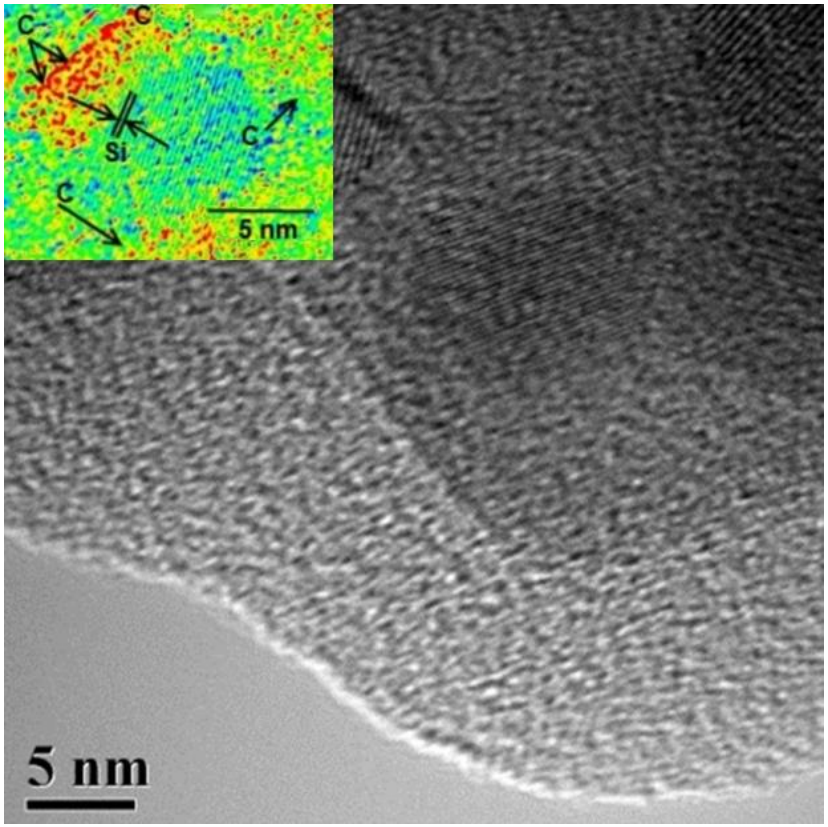


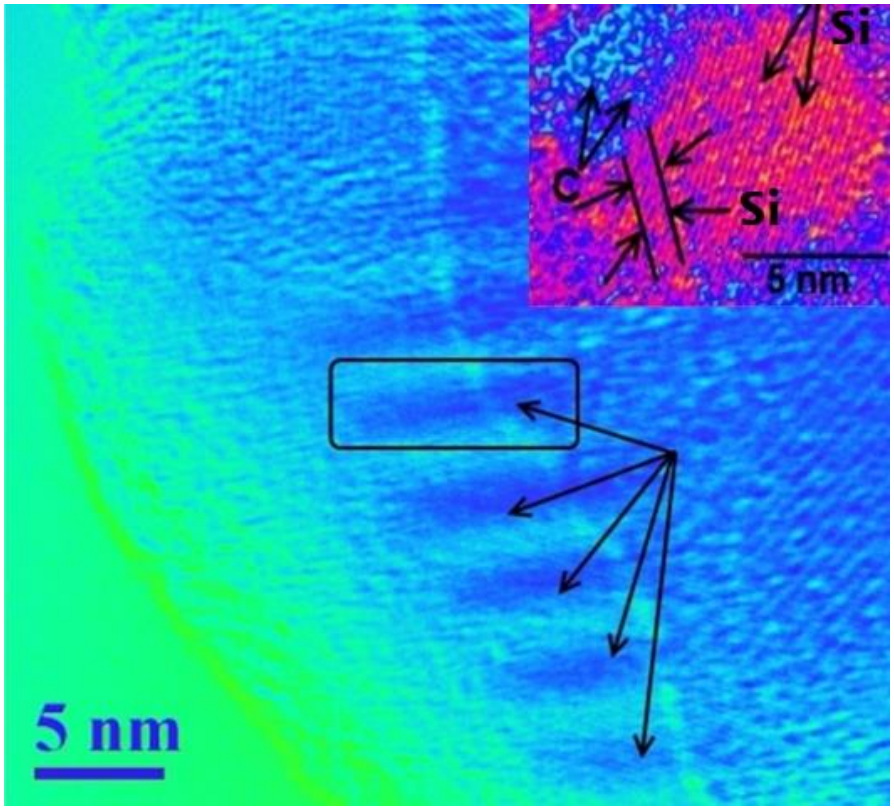




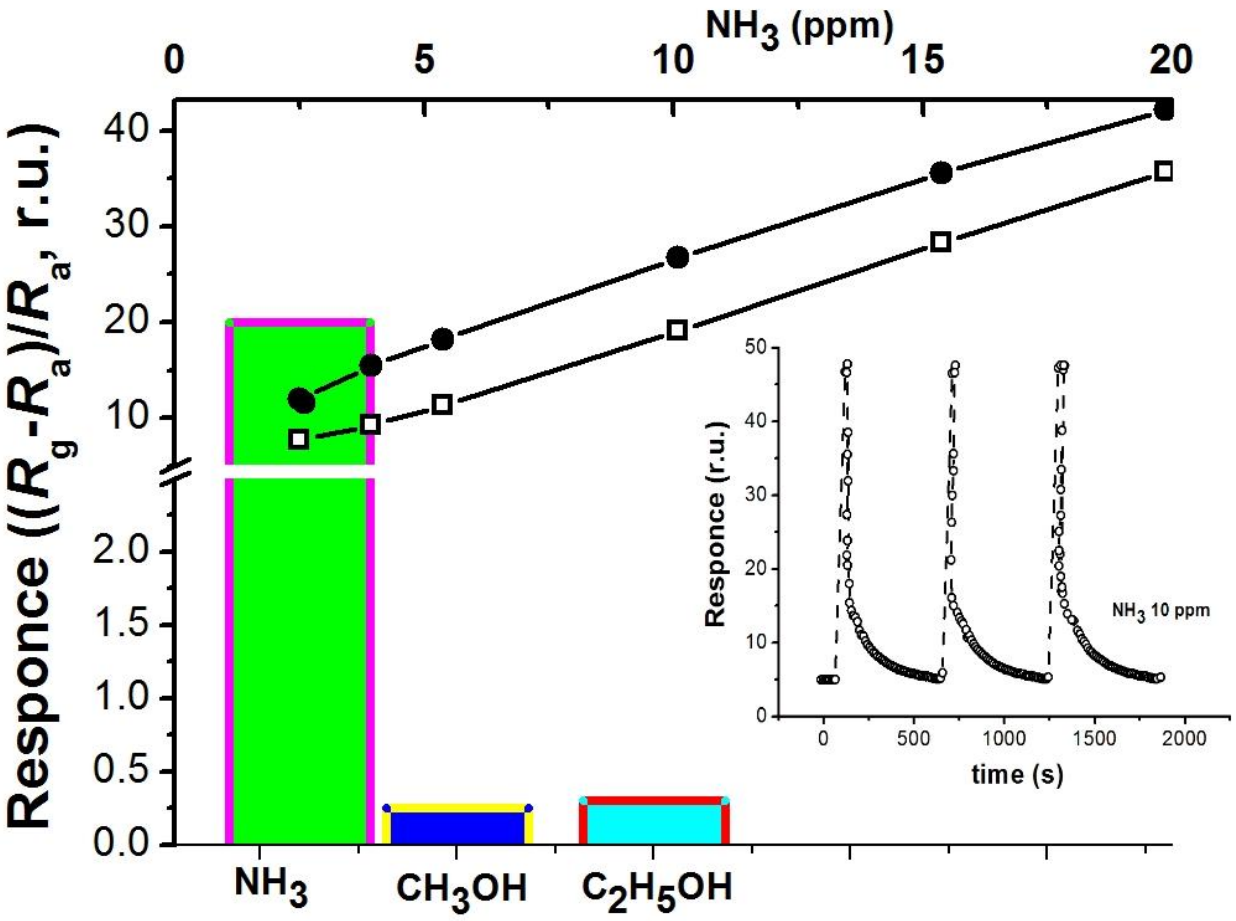


silicon NPs (black line) and nanohybrids (red line); points – before carbonization at 400 and 500 °C. Inserts are AFM images of silicon NPs and C-Si nanohybrids, scale in micrometers.



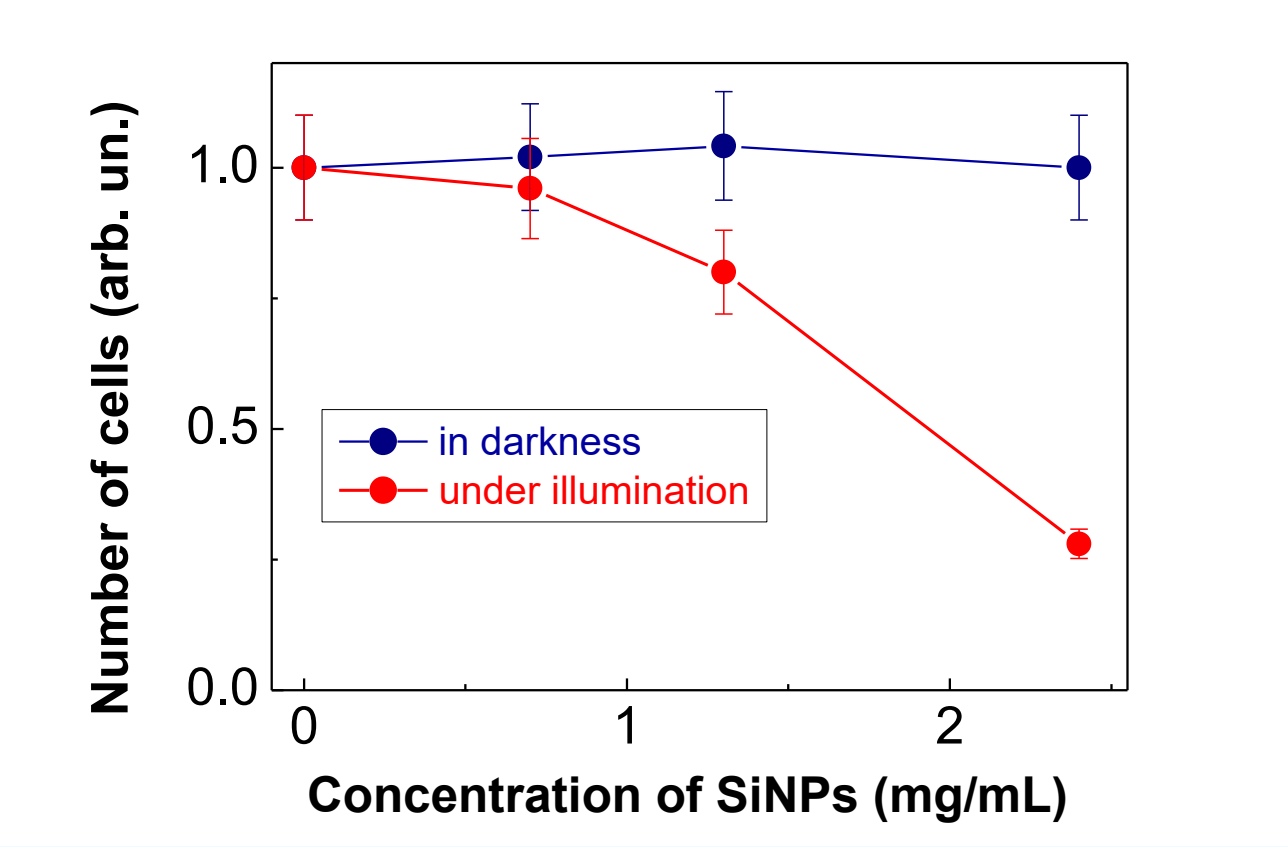


TEM (a) micrograph of nanohybrids and STEM High angle annular dark-field (HAADF) imaging



Response towards NH3, response comparison, and the response of nanohybrids sensors in alcohol/ammonia binary mixed gases.

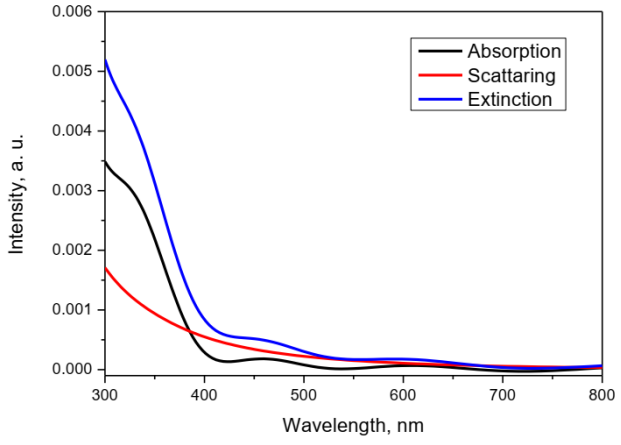
Suppression of the cancer cell proliferation by photo-excited nc-Si



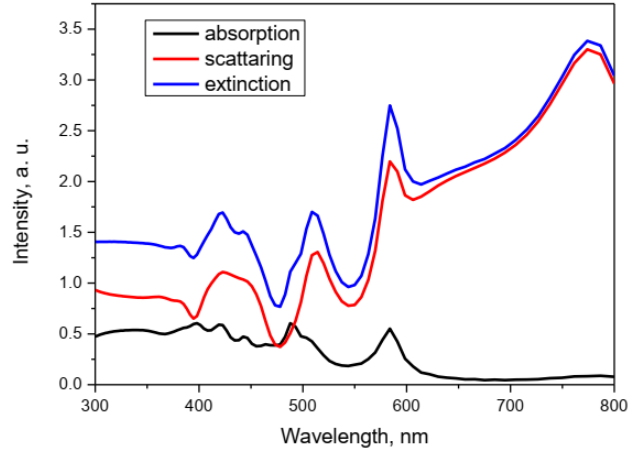
V.Yu. Timoshenko et all.,
JETP Lett. **83** (9), 423 (2006).

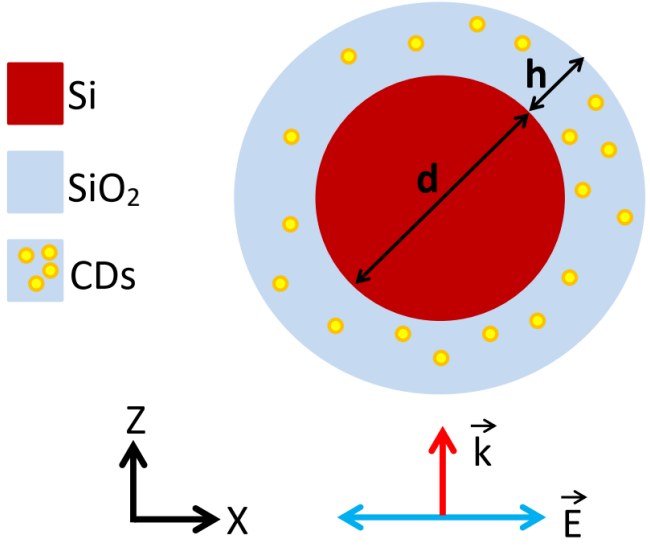
The decrease of cancer cells (mouse fibroblasts) number was observed in suspensions of silicon nanocrystals under illumination. This decrease is explained by the effect of singlet oxygen photosensitized by nc-Si.

Concentration of CDs $1{,}5 \cdot 10^{-4}$ nm^{-3}, d = 10 nm, h = 20 nm (in water)



Concentration of CDs $1{,}5 \cdot 10^{-4}$ nm^{-3}, d = 200 nm, h = 20 nm (in water)





Thank you for attention!