

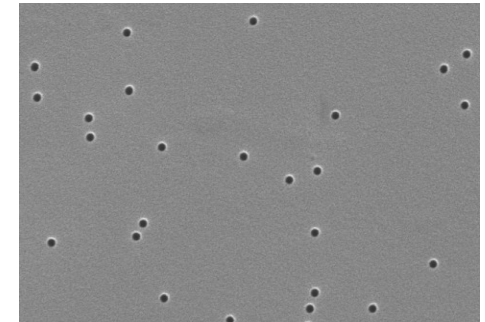
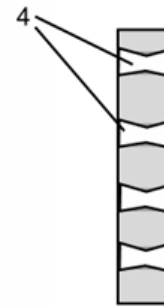
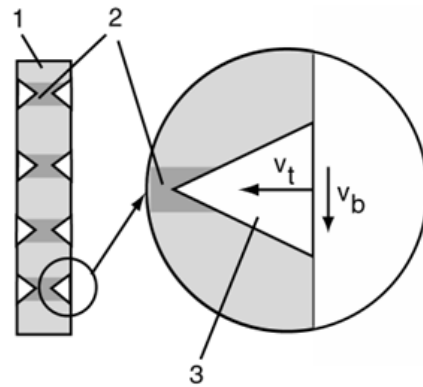
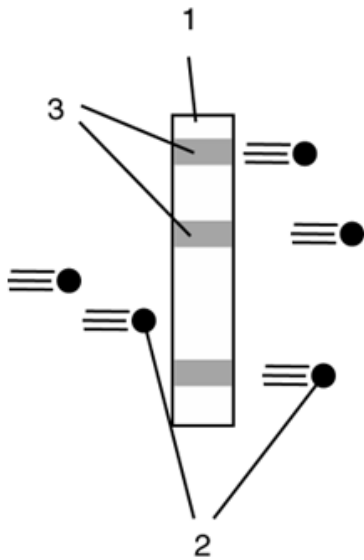
Fotodiode nanofir obtinute prin metoda sablon

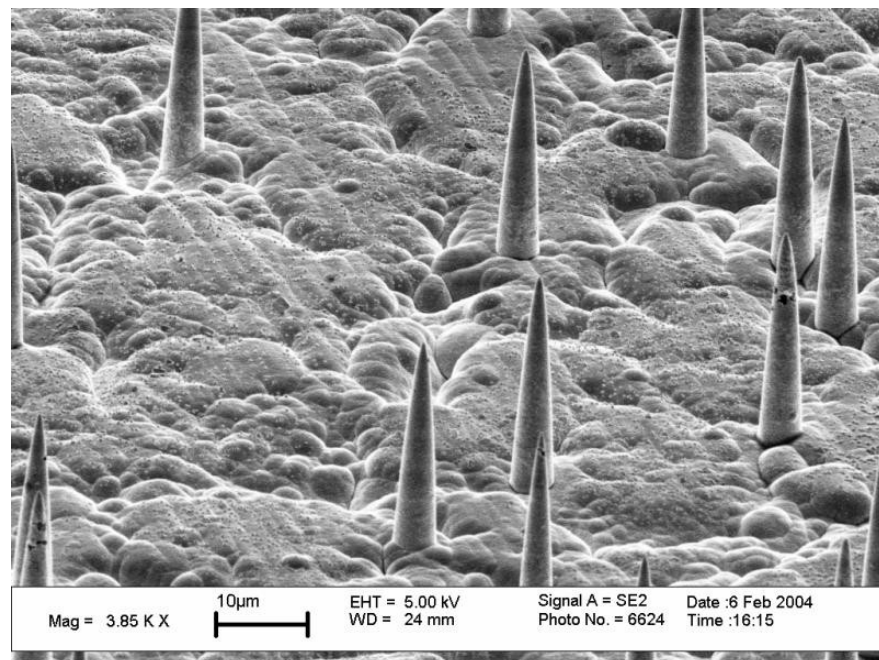
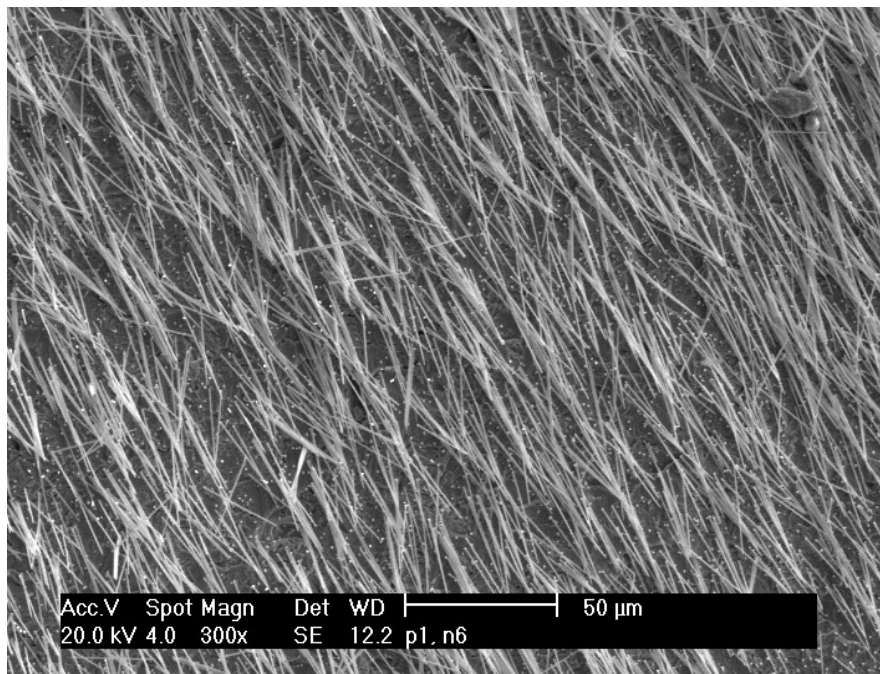
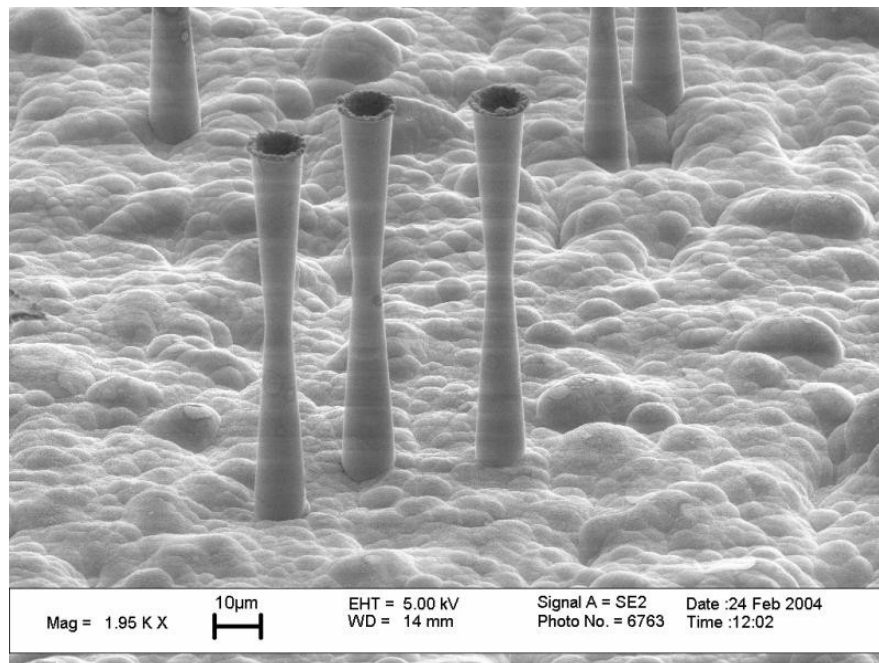
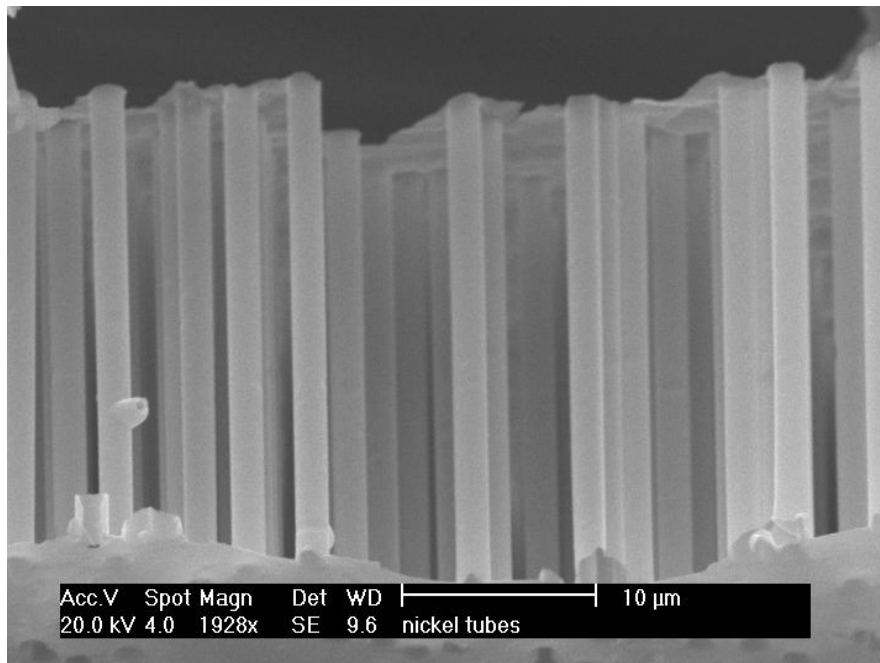
Dr. Ionut Enculescu

Metoda sablon permite obtinerea unor nanostructuri cu morfologie controlata

Ideea este de a obtine nanostructuri functionale intr-un mod simplu si reproductibil.

Metoda sablon in abordarea noastra:
Iradieria unei folii de polimer cu ioni grei rapizi
Corodarea controlata a urmelor ionilor





Algoritmul de preparare a nanofirelor multisegment cu proprietati fotovoltaice:



1

1. membrana sablon continand nanopori;



2

2. Depunerea electrodului de lucru (strat metalic de aur sau platina obtinut prin sputtering sau evaporare in vid) si a primului segment metalic (electrochimic);



3

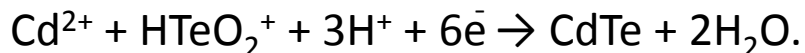
3. Depunerea segmentelor semiconductoare si umplerea completa a nanoporilor (incluzand cresterea unei structuri emisferice pe suprafata membranei pentru a obtine un contact electric stabil);



4

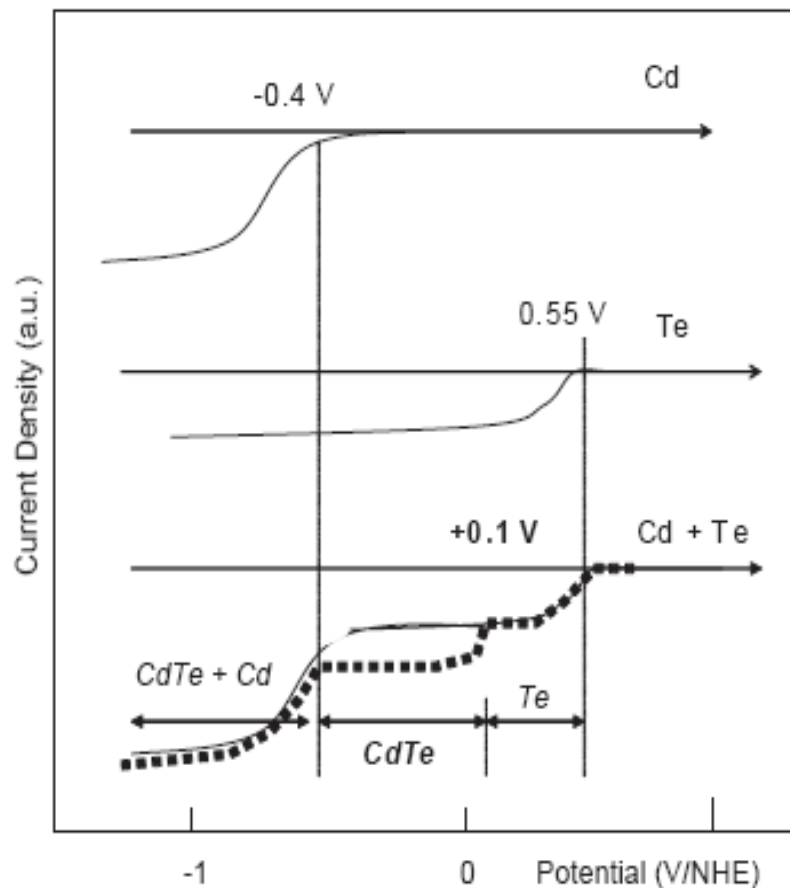
4. Depunerea celui de al doilea electrod (electrod transparent de ITO sau oxid de zinc) pentru a permite contactarea nanofirelor dar si iluminarea acestora. Depunerea va fi realizata folosind un fascicul de electroni pulsat, metoda ce permite obtinerea de straturi subtiri de calitate fara incalzirea substratelor.

Depunerea electrochimica a CdTe

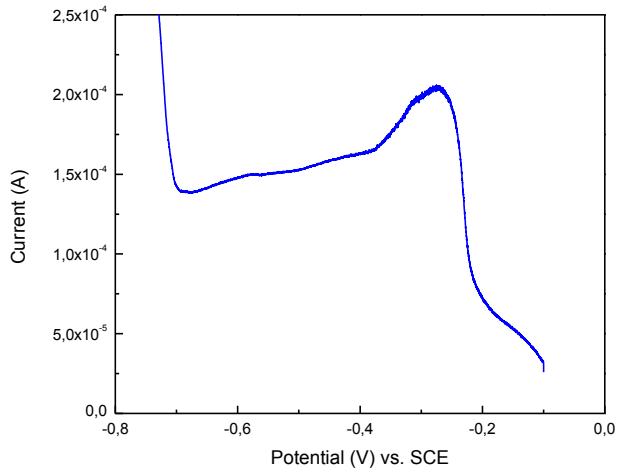


Depunerea CdTe din solutie apoasa:

- depunerea Te;
- depunerea Cd;
- depunerea CdTe, linia continua corespunde depunerii fara nici o interactie intre Cd si Te elementale. Linia punctata corespunde situatiei in care se formeaza compusul CdTe tinand cont de energia libera de formare a compusului. Depunerea compusului stoichiometric se realizeaza intr-un domeniu larg de potential.

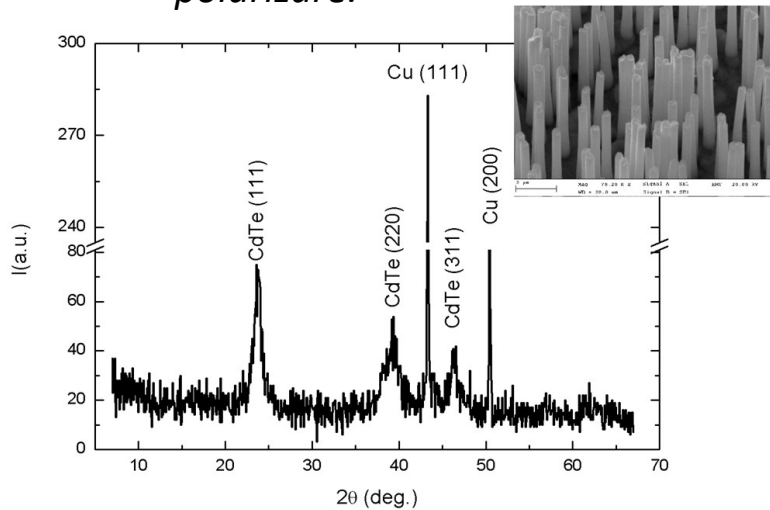
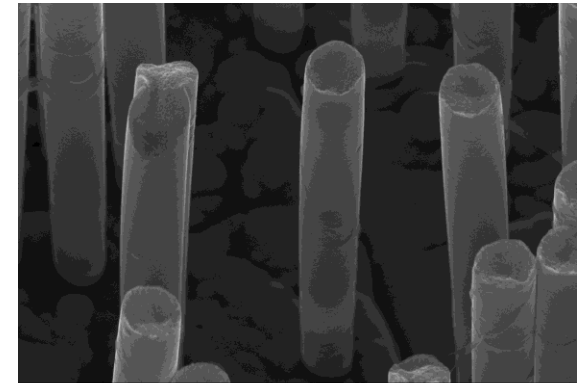
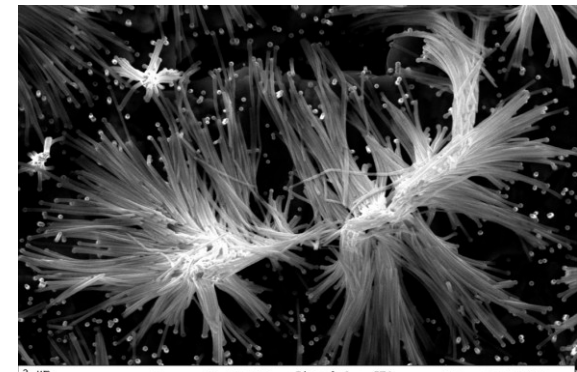
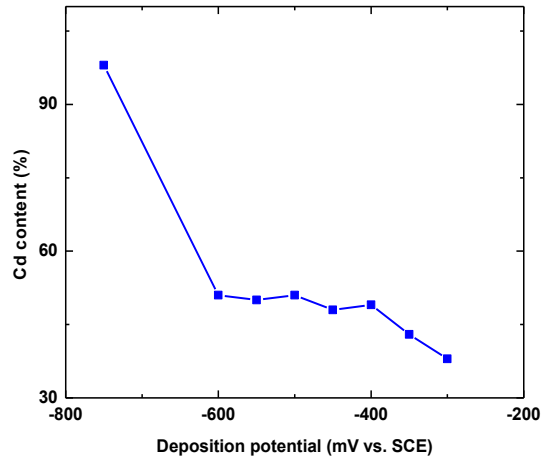


Baie continand PVP si cu pH>1,6

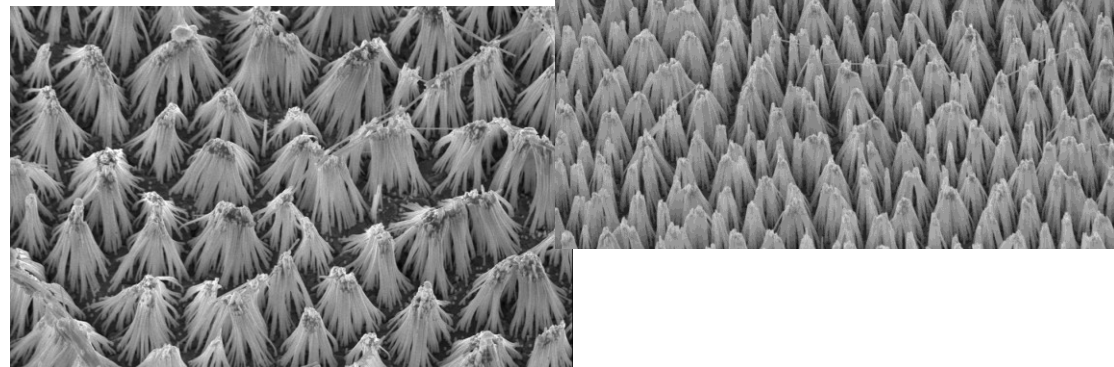


Curba de polarizare.

Exista platou larg de stoichiometrie.



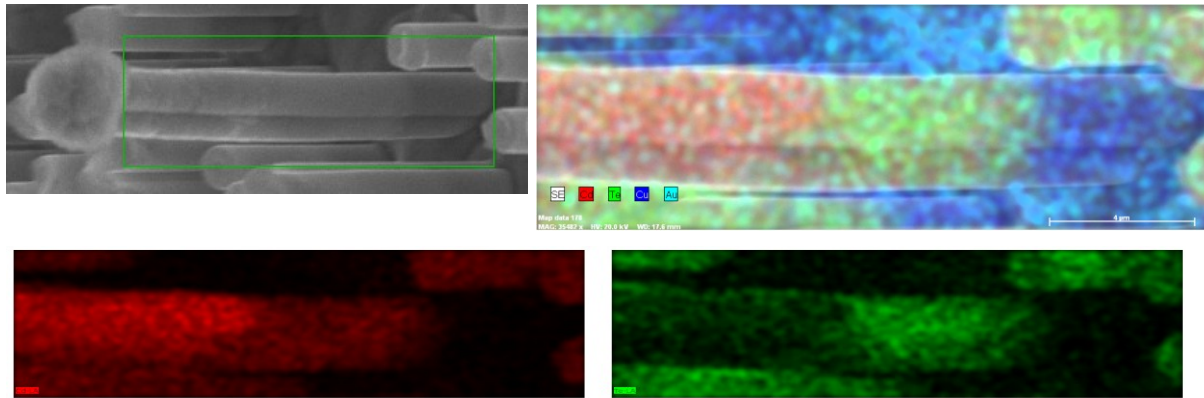
Morfologia firelor este buna, depuneri uniforme pe arii largi.



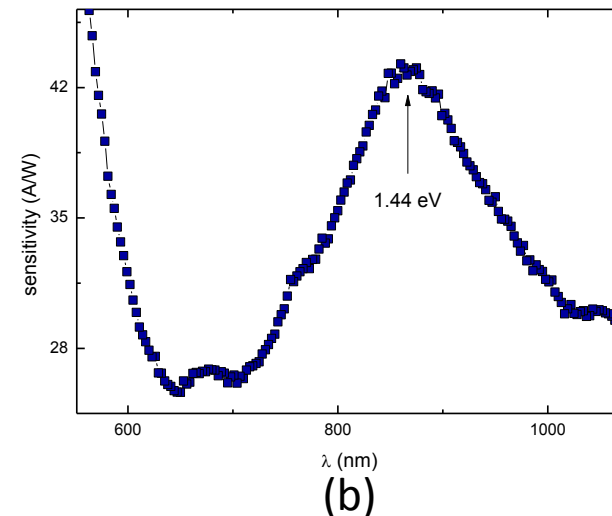
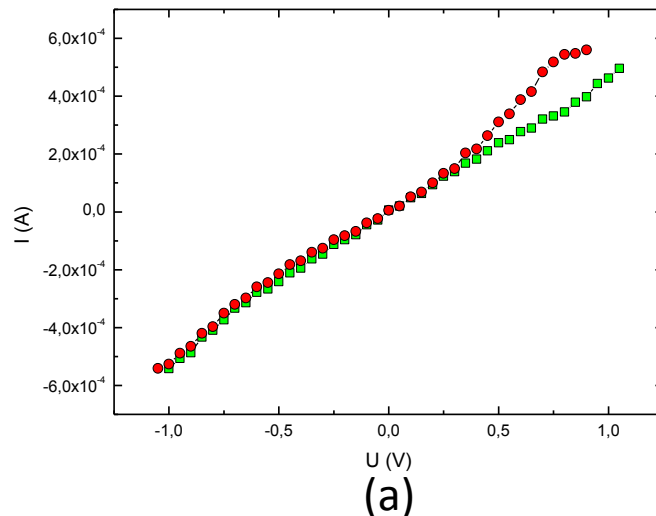
Fire policristaline cu structura cubica.

Depuneri de fire multisegment. Fotoconductori si fotodiode nanofir.

Depunerile la potentiale diferite duc la cresterea de segmente cu compozitii diferite.

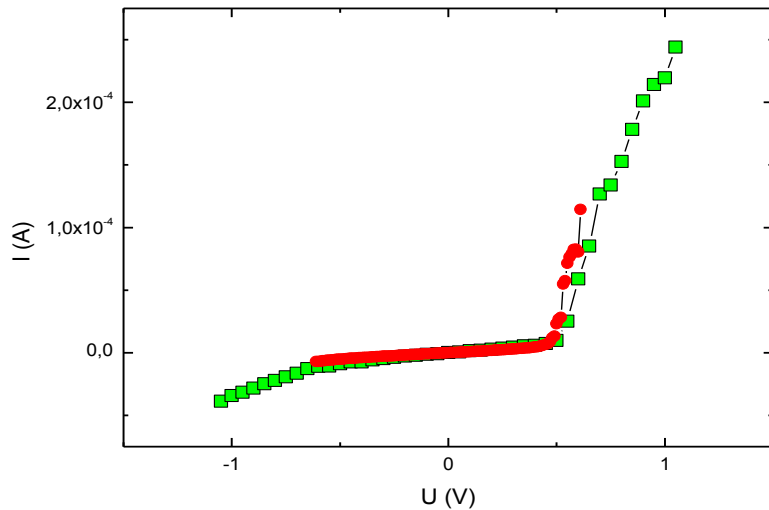


Fire multisegment (imagini SEM si EDX mapping evidentiind segmentele de Cd si CdTe (fiecare culoare reprezinta un element: rosu pentru Cd, verde pentru Te, albastru este Cu, bleu Au).

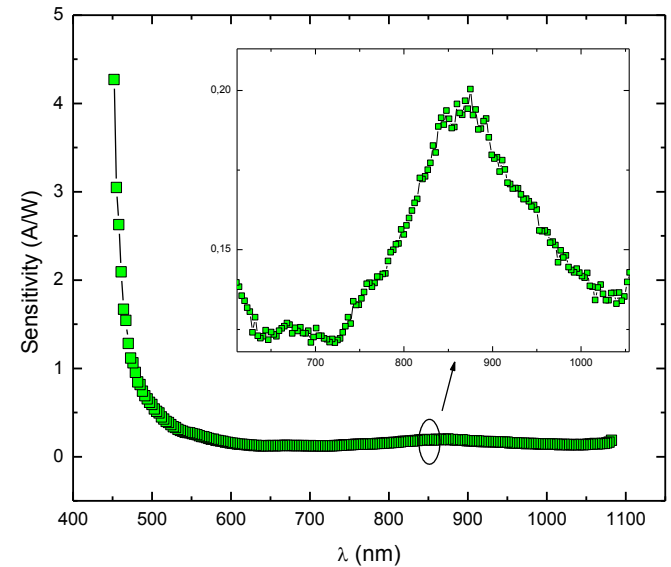


(a) Caracteristici I-V la temperatura camerei pentru matrici de fire multisegment Cd-CdTe-Cd: patrate pline reprezinta curentul la intuneric, cu cercuri goale este reprezentata caracteristica cand proba este iluminata. (b) Sensibilitatea spectrala a probei. Maximul corespunde valorii benzii interzise pentru CdTe. Baia de depunere: 0,2M Cd, 1mM Te si 0,1% PVP la pH 2,1.

Depuneri de fire multisegment. Fotoconductori si fotodiode nanofir.

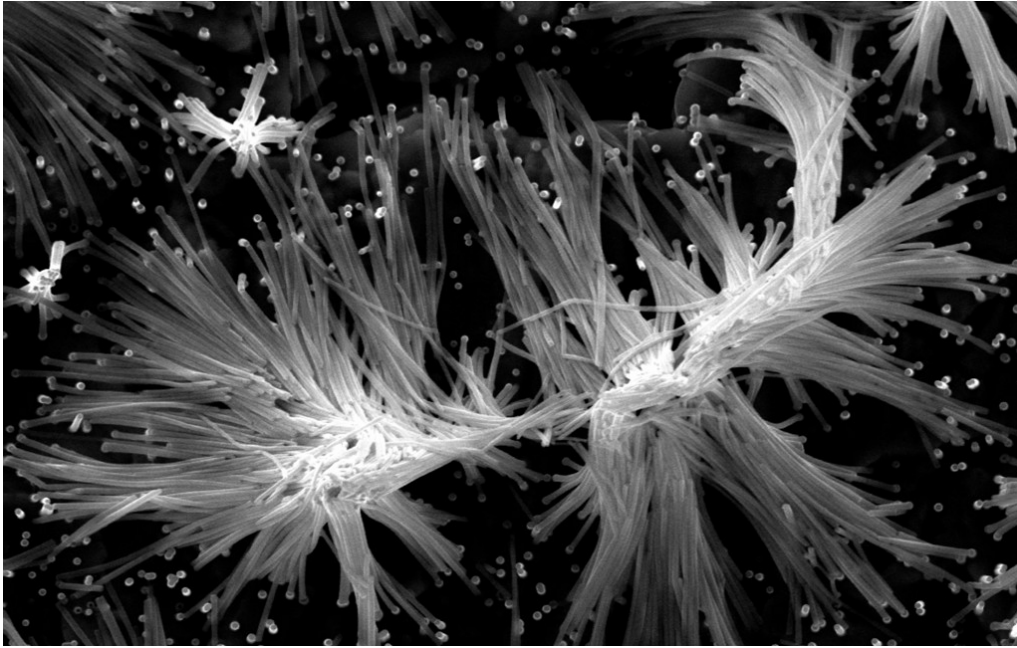


Caracteristica I-V pentru o matrice de diode nanofir multisegment Cd-CdTe(p)-CdTe(n)-Cd: verde - curentul la intuneric, rosu - curentul cand proba este iluminata



Sensibilitatea spectrala a aceleasi matrici de diode nanofir.

Urmatorul pas va fi obtinerea unor diode nanofir heterojonctiune: CdTe – CdS si CdTe - ZnO



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Dr. Elena Matei

Universitatea Bucuresti (caracterizare fotoconductie)
Prof. Stefan Antohe
Conf. Lucian Ion

Mulumiri: CNMP contract D1 1 060/2007, GSI Darmstadt - beamtime