



FIZIKA DANAS

Otvoreni dan Fizičkog odsjeka

13. travnja 2018.

Kako uzgojiti kristale?

Filip Orbanić

Fizički odsjek, PMF, Zagreb

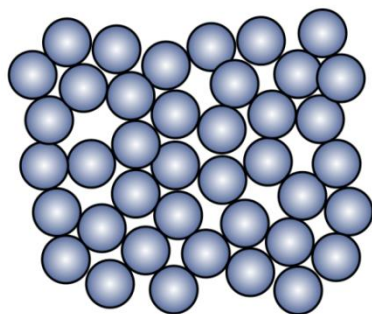
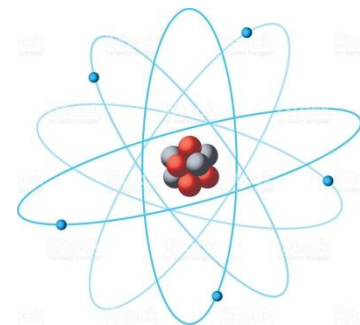
Uvod

- U fizici se stalno traga za novim materijalima zanimljivih svojstava → otkrivanje nove fizike i tehnološka primjena.

Kako napraviti uzorke novih materijala i pripremiti ih za fizikalna mjerenja?



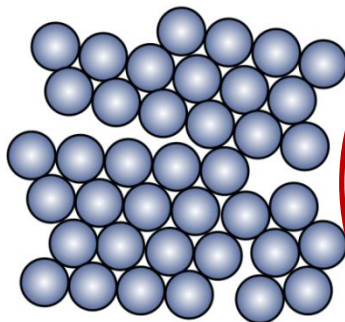
Struktura čvrstih tvari



Amorfna



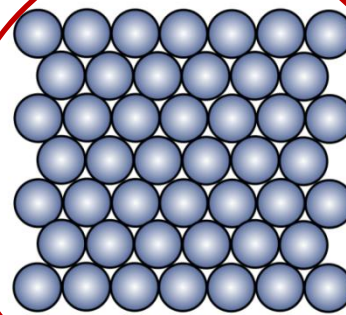
Nasumično raspoređeni atomi.



Polikristalna



Sitna zrna u kojima su atomi periodički složeni.

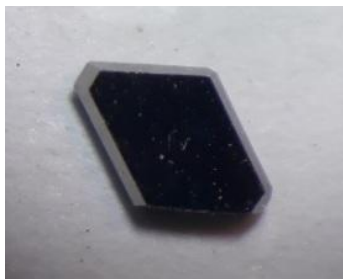


Kristalna



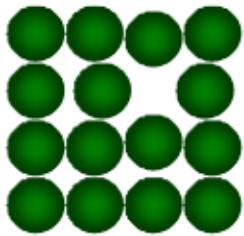
Svi atomi su složeni u periodičku rešetku.

kristalni uzorak → makroskopski komad materijala kristalne strukture.

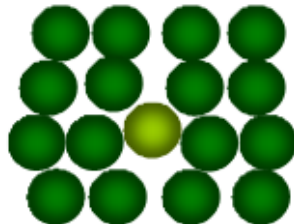


Struktura čvrstih stvari

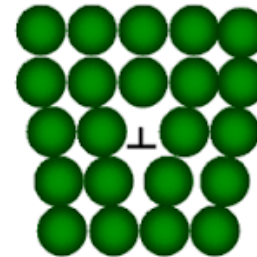
- Ne postoje savršeni kristali → defekti u kristalnoj strukturi!



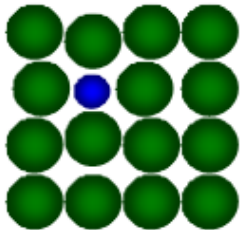
Praznina



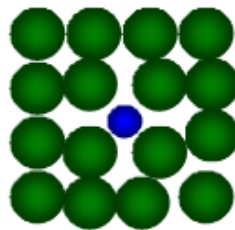
Intersticijski atom



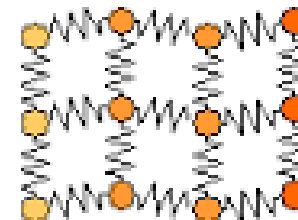
Linijski defekt



Regularna nečistoća



Intersticijska nečistoća

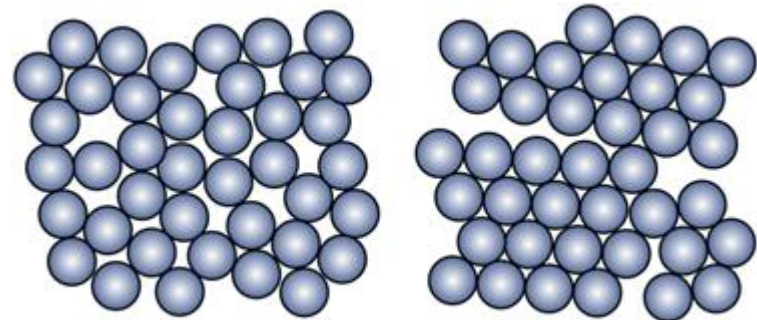


Vibracije rešetke

Želimo kristalni uzorak sa što manje defekata.

Sinteza uzoraka

- Jako čisti kemijski elementi (99.9999%)



Sinteza uzoraka

- Elementi se zatvaraju u kvarcnu (SiO_2) ampulu. Unutar ampule je visoki vakuum (10^{-6} mbar)

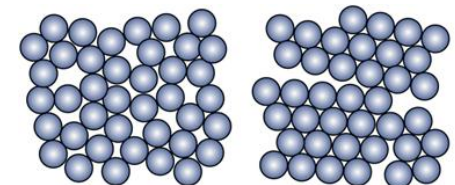


Zataljivanje ampule .

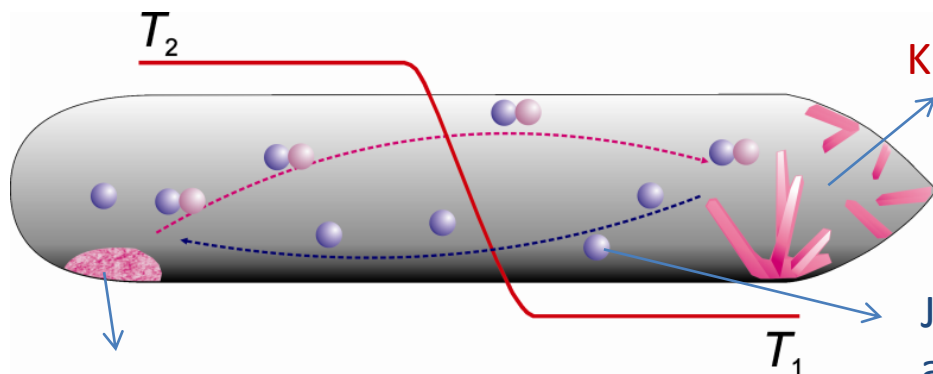
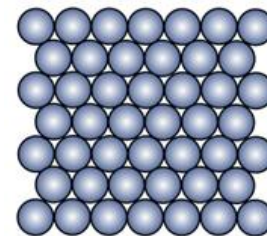
Plamen mješavine
vodika i kisika.



Materijal u ampuli
s vakuumom.



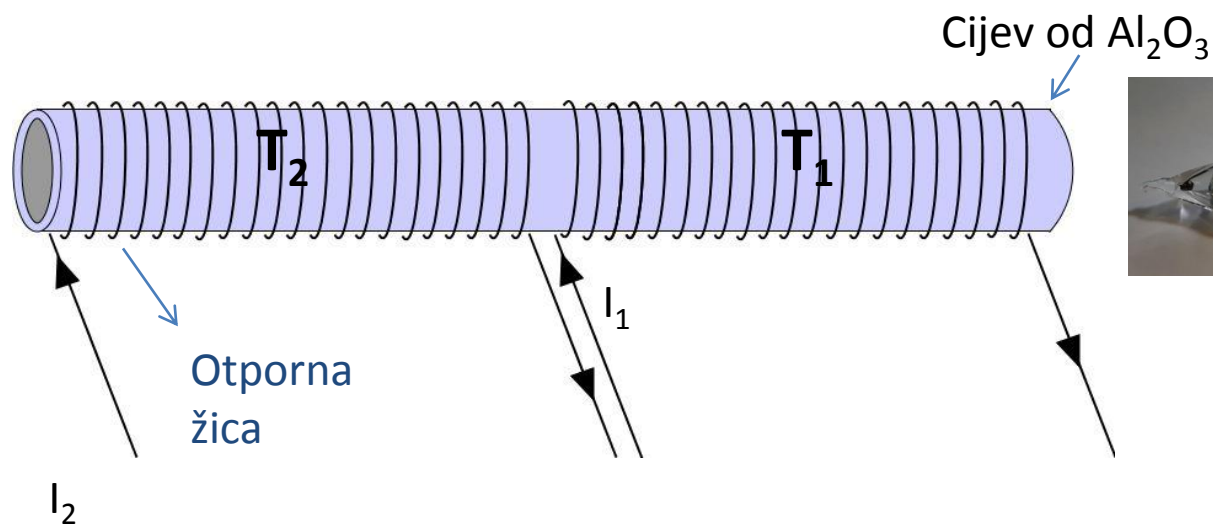
Kako kristal raste?



Polikristalni ili amorfni materijal.

Kristali!

Jod (prenosi atome materijala).

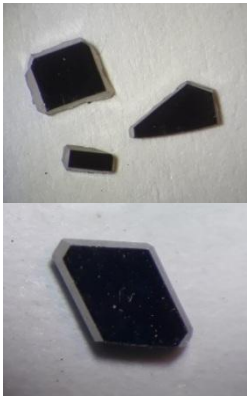
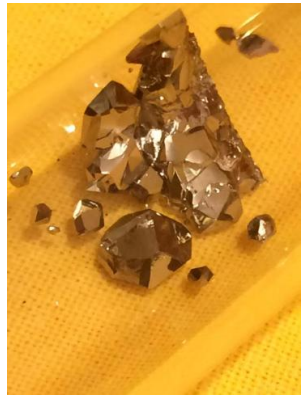


Cijev od Al_2O_3

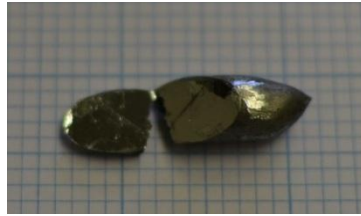
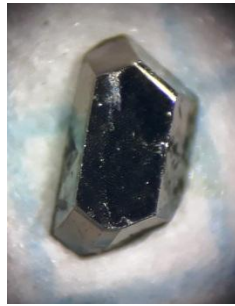
Otporna žica



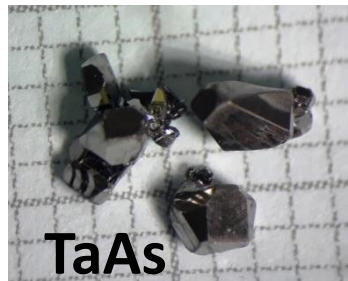
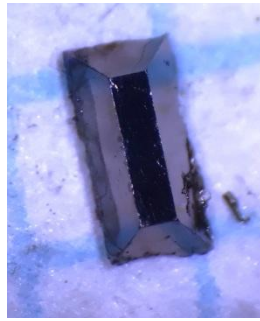
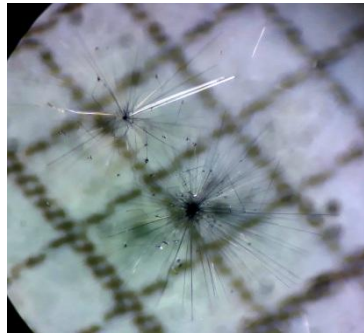
Kristali



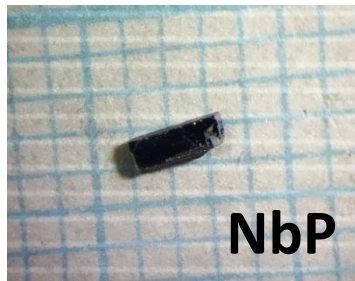
Cd_3As_2



BiSbTeSe_2



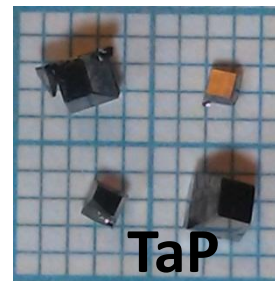
TaAs



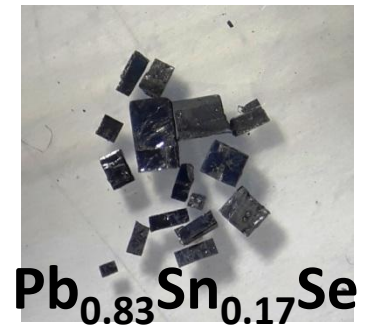
NbP



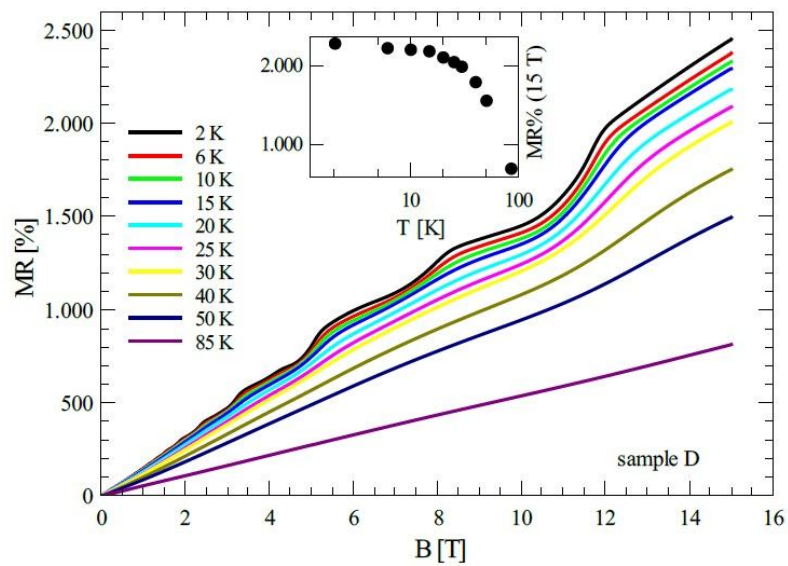
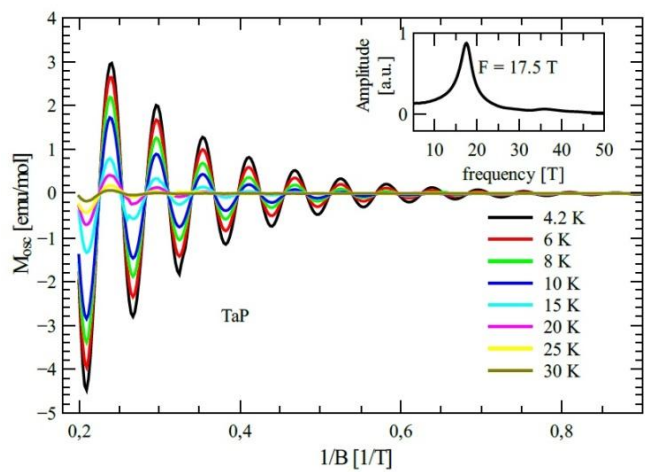
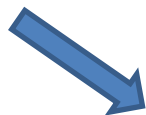
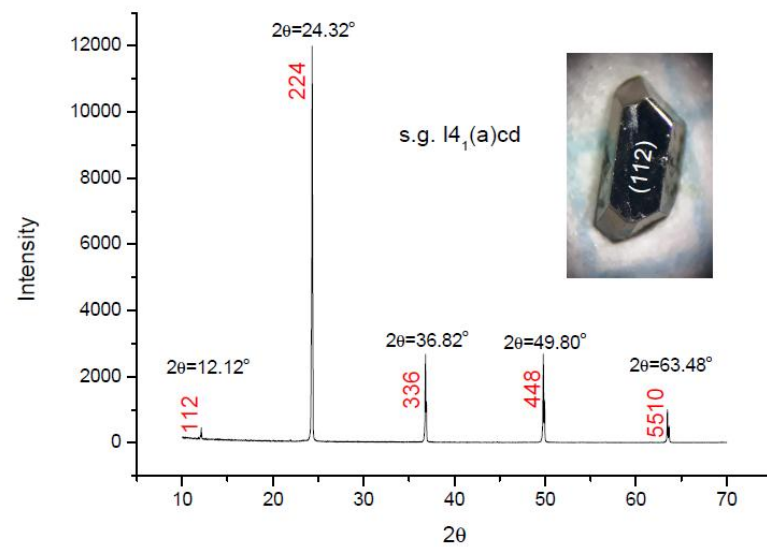
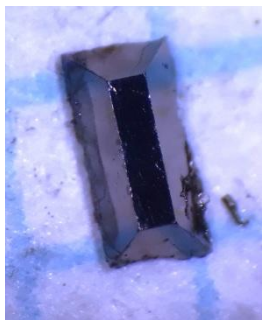
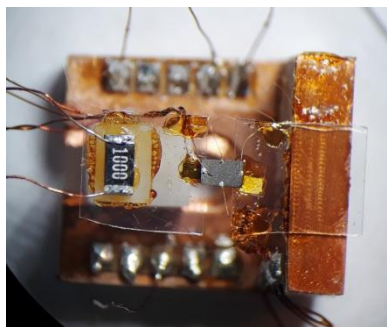
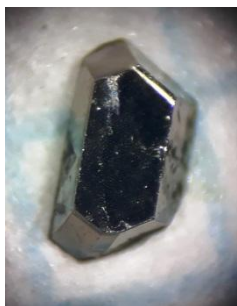
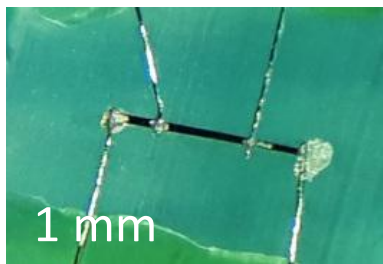
ZrSiS



TaP



$\text{Pb}_{0.83}\text{Sn}_{0.17}\text{Se}$





Hvala na pažnji.

Pitanja?