

## 2- ma'ruza. Metallarning atom-kristall tuzilishi

### Reja

§1. Amorf va kristall jismlar.

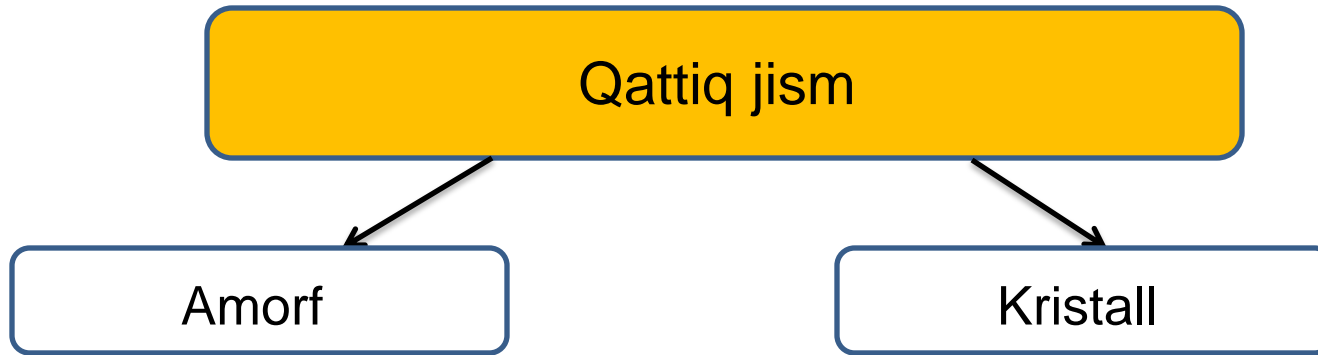
§2. Kristall panjaralarning asosiy turlari.

§3. Metallar allotropiyasi.

§4. Birlamchi va ikkilamchi kristallanish. Faza. Kritik nuqtalar.

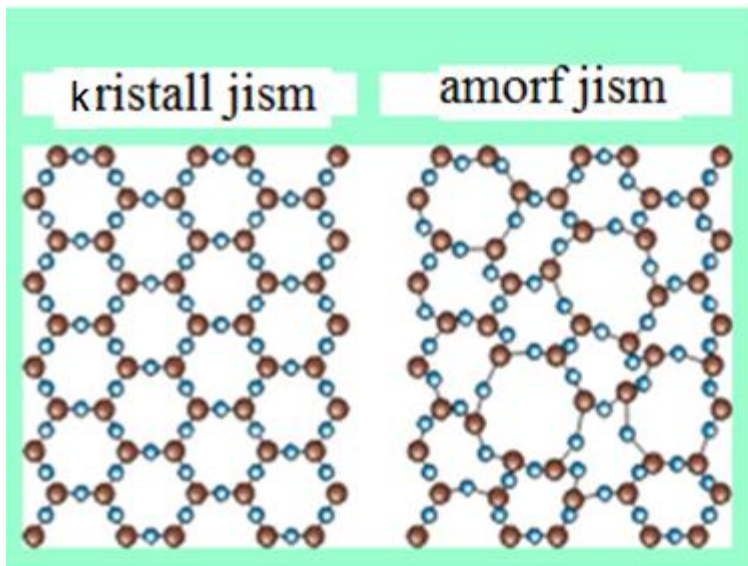
§5. Metallarning haqiqiy tuzilishi. Kristall panjaraning buzilishlari.

## § 1. Amorf va kristall jismlari.



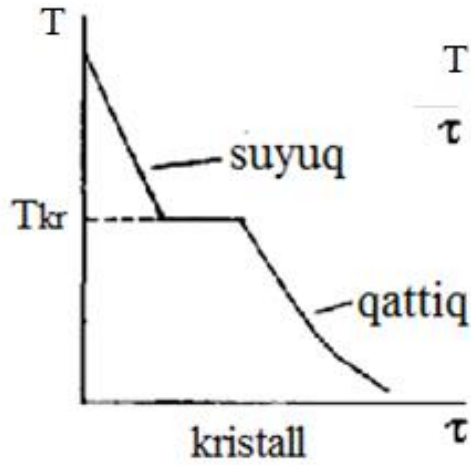
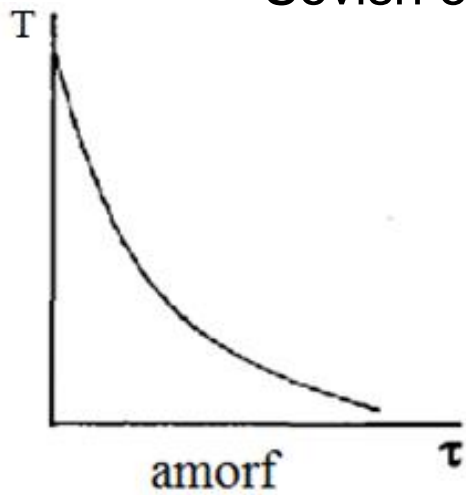
- 1) Atomlar tarnibsiz joylashgah
- 2) Erish temperaturasi noaniq  
mom, shisha, plastilin

- 1) Atomlar tarnib bilan joylashgah
- 2) Erish temperaturasi aniq  
NaCl, grafit, metallar  $10^{13}$ Gts



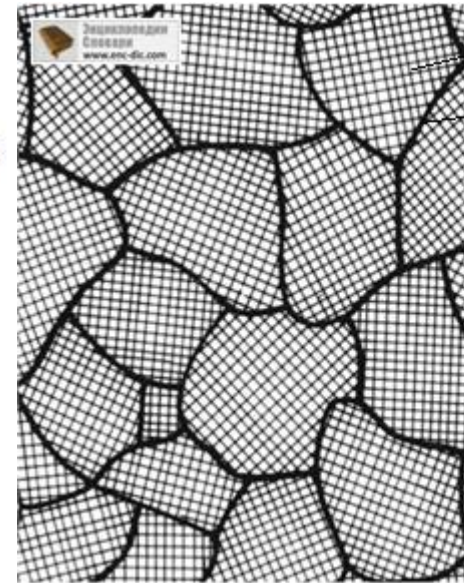
2.1 rasm

## Sovish egri chiziqlar



$T$  - temperatura  
 $\tau$  - vaqt

2.2 rasm



dona  
dona  
chegarasi

2.3 rasm



2.4 rasm. Metallarni kristallanish jarayoni

## §2. Kristall panjaralarning asosiy turlari.

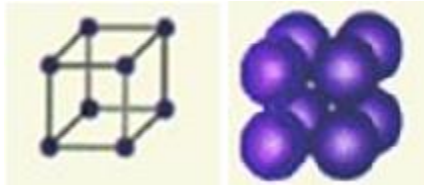
Kristall panjara —

kristallarda atom yoki ionlarning fazoda davriy joylashishi **kristall panjara** deyiladi.

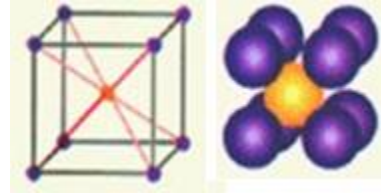
Kristall panjaraning atom yoki ionlar joylashgan nuqtalari **tugunlar** deb nomlanadi.

Kristal donalari —

polikristall metallda yuqori nuqsonli chegaralar bilan ajralgan hajm **kristall donasi** deyiladi

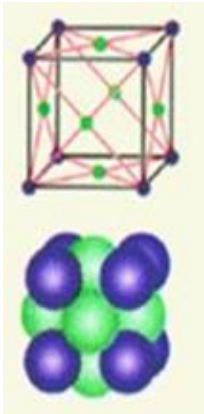


elementar  
kub panjara;

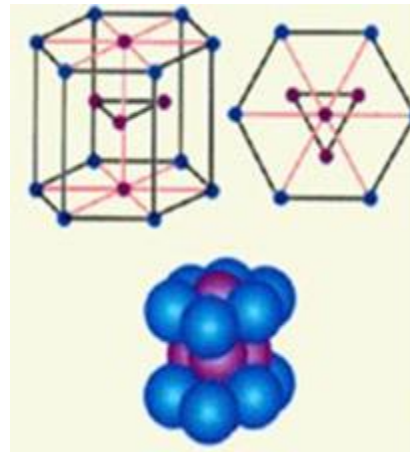


hajmi markazlashgan  
elementar kub panjara  
9-atom

$Fe_{\alpha}$ , Cr, W, V, Mo, Ta, Li



yoqlari  
markazlashgan  
elementar kub  
panjara -  
14 atom  
 $Fe_{\gamma}$ , Al, Cu, Pb, Au,  
Ag....



olti qirrali  
(geksagonal)  
elementar panjara –  
17 atom  
Zn, Cd, Mg,  $Ni_{\alpha}$ ,  $Co_{\alpha}$   
,  $Ti_{\alpha}$  .....

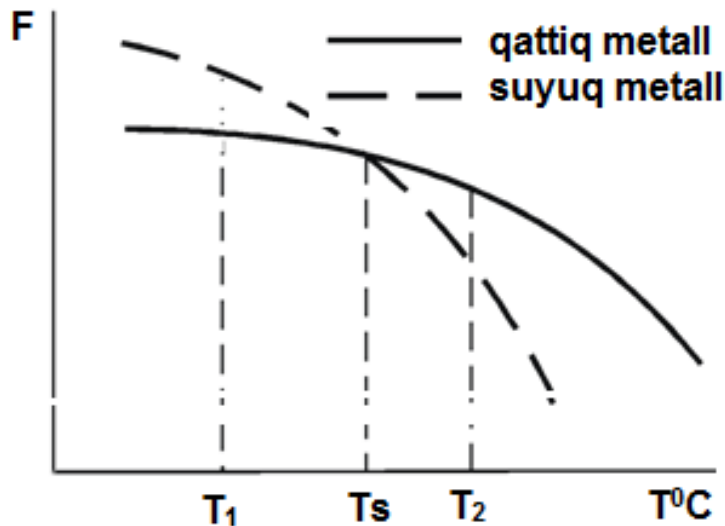
2.5 rasm.

### §3. Metallar allotropiyasi. Sof temirning sovish egri chizig'i.

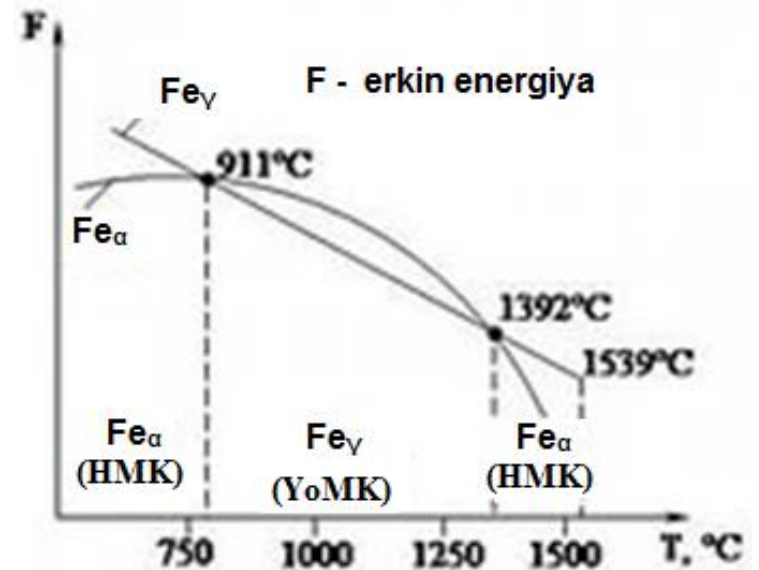
Ba'zi metallar (Fe, Ti, Sn va boshqalar) ma'lum temperaturalarda kristal tuzilishunu, ya'ni kristall panjaraning turini o'zgartiradi.

Bu hodisa **allotropiya** deb nomlanadi. Bu o'tishlar (bitta kristal panjaradan ikkinchisiga o'tish) allotropik o'zgarishlar deyiladi.

Jismning **ichki energiyasi** — bu jism zarrachalarning kinetik energiyalar va zarrachalarning o'zaro ta'sirining potentsial energiyalarning yig'indisi.

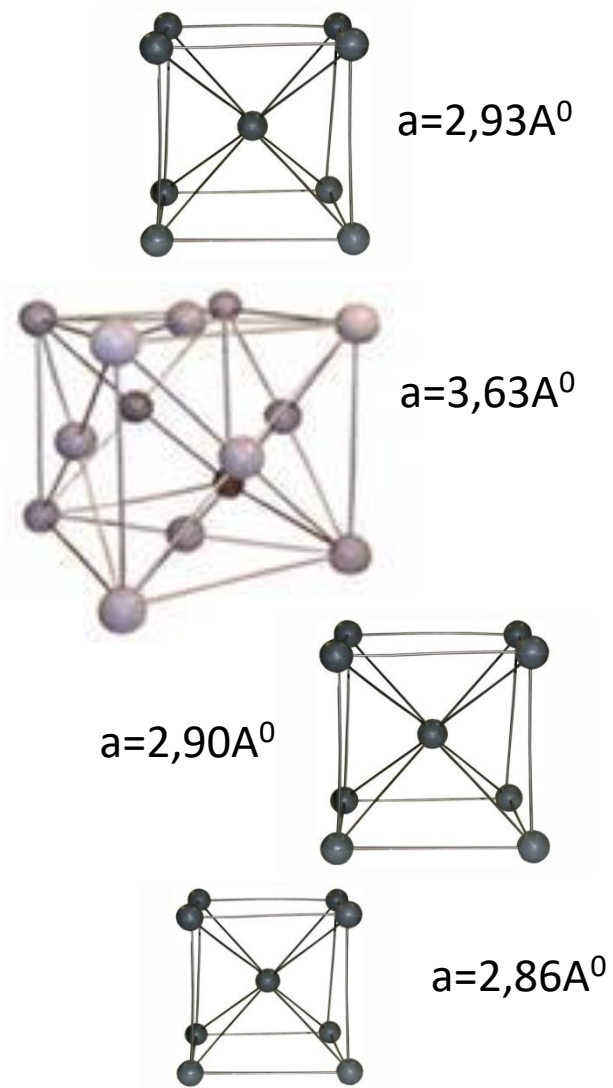
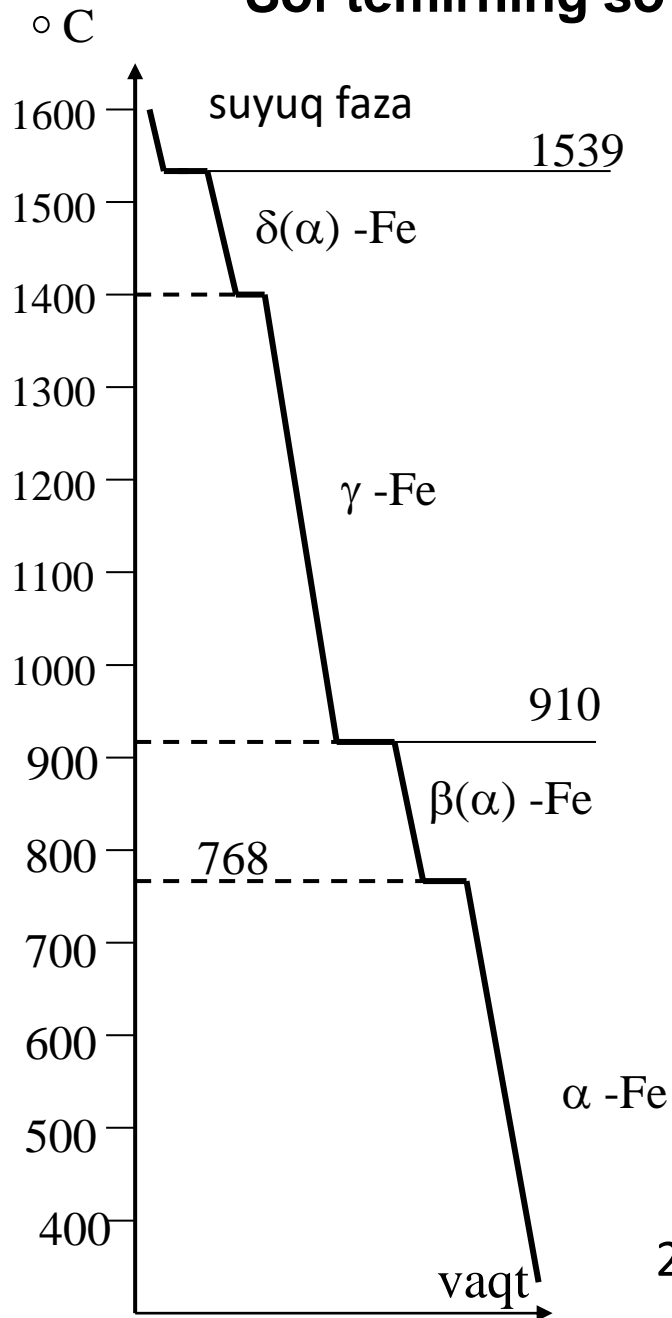


2.6 rasm



2.7 rasm

# Sof temirning sovish egri chizig'i



2.6 rasm

## §4. Birlamchi va ikkilamchi kristallanish. Faza. Kritik nuqtalar.

birlamchi  
kristallanish



Qotishmalarni suyuq qolatdan qattiq qolatga  
o'tishi

ikkilamchi  
kristallanish



Qattiq xolatda yangi kristall panjaralarini xosil bo'lishi

kritik nuqtalar



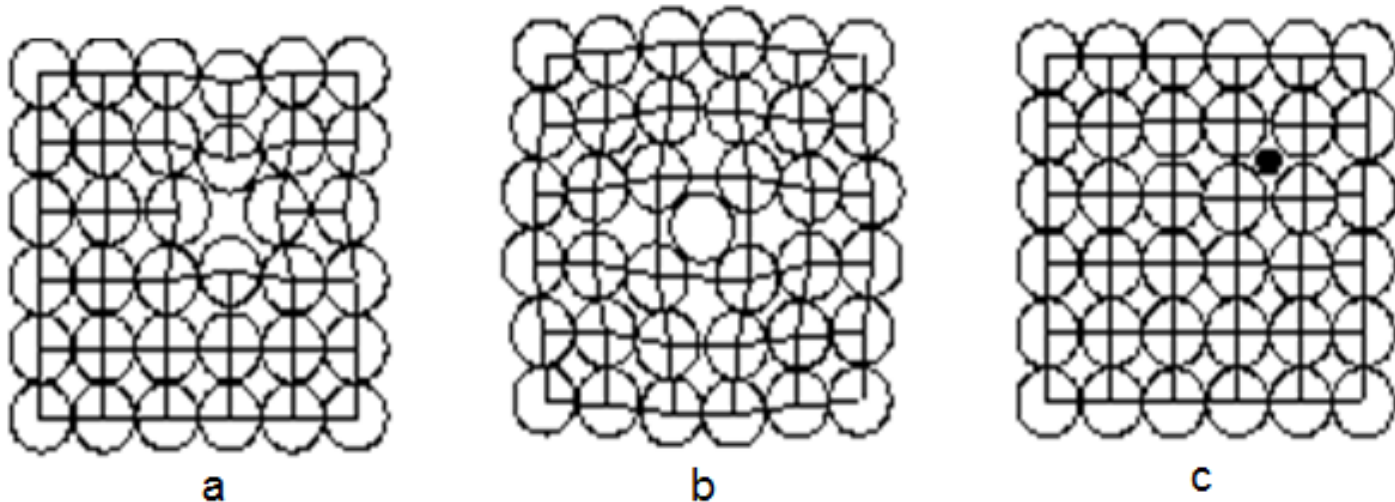
Kristallanish jarayonni boshlanilishi yoki tugallanishi



## §5. Metallarning haqiqiy tuzilishi. Kristall panjaraning buzilishlari.

Kristallarning haqiqiy tuzilishida ideal kristallardan farqli ravishda metall xossalariga ta'sir qiladigan juda ko'p buzilishlar mavjud.

Eng ko'p nuqtaviy, chiziqli va sirt yuzasida joylashgan buzilishlar uchraydi.



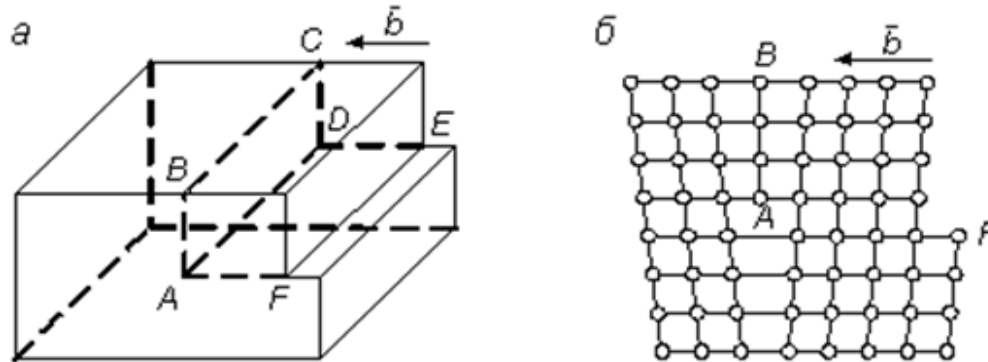
2.7 rasm Kristall panjaraning nuqtaviy buzilishlari  
a - vakansiya; b - uzining qo'shilgan atomi;  
c - boshqa elementining qo'shilgan atomi.

Nuqtaviy buzilishlar kristall panjarani o'zgartiradi va shu bilan metallarning fizik xossalariniga ta'sir qiladi.

## Chiziqli buzilishlar

Chiziqli buzilishlarga dislokatsiyalar kiradi. Ular chetdagi va vintli dislokatsiyalarga bo'linadi.

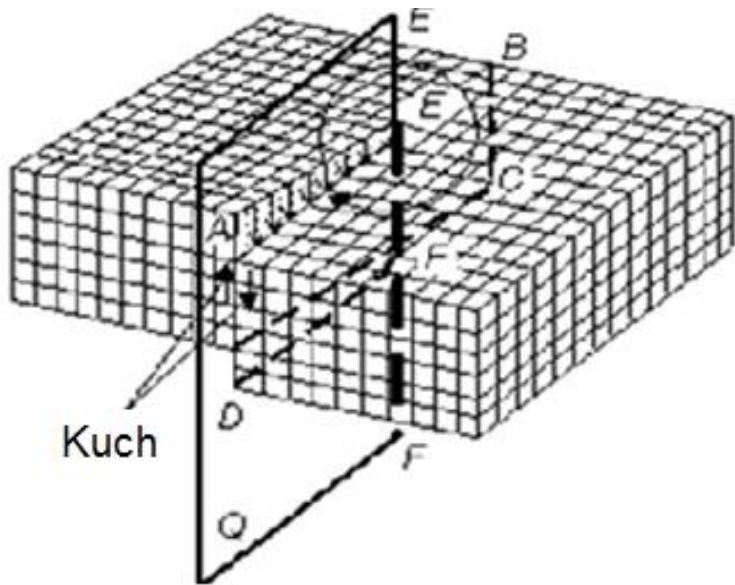
Dislokatsiyalar kristallanish, plastik deformatsiyalash, termik ishlash kabi jarayonlardan keyin paydo bo'ladi.



2.8 rasm Chetdagi dislokatsiya

Rasmda bitta “ortiqcha” ekstra tekislik deb nomlanadigan AB yarim tekisligi bo'lgan kristall panjaraning qismi keltirilgan.

A nuqtadan surish yo'nalishiga tik o'tgan chiziq chetdagi dislokatsiya deyiladi. U ekstra tekislikning cheti bo'ladi.

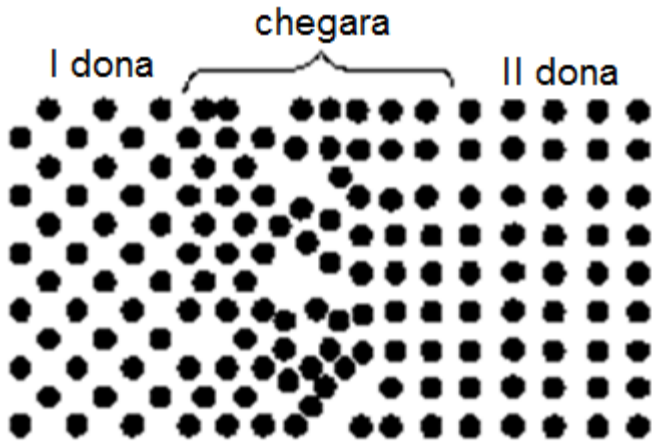


2.9 rasm. Vintli dislokatsiya

Vintli dislokatsiyalar atom qatlamlarni Q tekisligi bo'yicha qisman surish natijasida hosil bo'ladi.

Kristall EF chizig'i (dislokatsiya chizig'i) atrofida buralganday bo'ladi.

## Sirt yuzadagi buzilishlar



2.10 rasm. Donalar orasida chegaraning tuzilmasi

Metall juda ko'p mayda kristallardan tashkil topgan. Donalar orasida o'tish qatlam qalinligi 5-15 atom masofalarga teng (2.7 rasm). Donalar chegarasida dislokatsiya va har xil qo'shimchalar to'planadi va bu metallning mexanik hossalari jiddiy ta'sir qiladi.

## Nazorat savollri

1. Amorf va kristall jismlar nima bilan farq qiladi?
2. Kristall panjaralarning asosiy turlarini ta'riflang. Kristall panjara va donalar deganda nimani tushunasiz?
3. Metallar allotropiya degani nima va uning sabalarini ta'riflab bering. Sof temirning sovish egri chizig'ida qanday kritik nuqtalar bor va ularda qanday jarayonlar kechadi?
4. Kristall panjaraning buzilishlari degani nima? Nuqtaviy buzilishlar nimadan iborat?
5. Chiziqli va sirt yuzalarida buzilishlar qanday hosil bo'ladi