



TOSHKENT IRRIGATSIYA VA QISHLOQ  
XO'JALIGINI MEXANIZATSIYALASH  
MUHANDISLARI INSTITUTI



**FAN:**

MATERIALSHUNOSLIK VA  
KONZTRUKSON MATERIALLAR  
TEXNOLOGIYASI

MAVZU

**04**

TERMİK ISHLASH ASOSLARI



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Umumtexnik fanlar kafedrası

katta o'qituvchisi



## Reja:

- **Termik ishlashning nazariy asoslari.**
- **Termik ishlar uchun qo'llanaldigan qizdirish qurilmalari .**
- **Termik ishlash turlari**

# • Termik ishlashning nazariy asoslari.

Metallarning kerakli xossalari olish uchun strukturalarini o'zgartirish hisobiga ularni qizdirib, shu temperaturada tutib turib, sekin yoki tez sovitish jarayoni **termik ishlash** deyiladi.

**Termik ishlash rejimi** - termik ishlashni amalga oshirish sharoitlari. Rejim ko'rsatkichlariga quyidagilar kiradi: qizdirish temperaturasi, tutib turish vaqti, qizdirish va sovitish tezliklari.

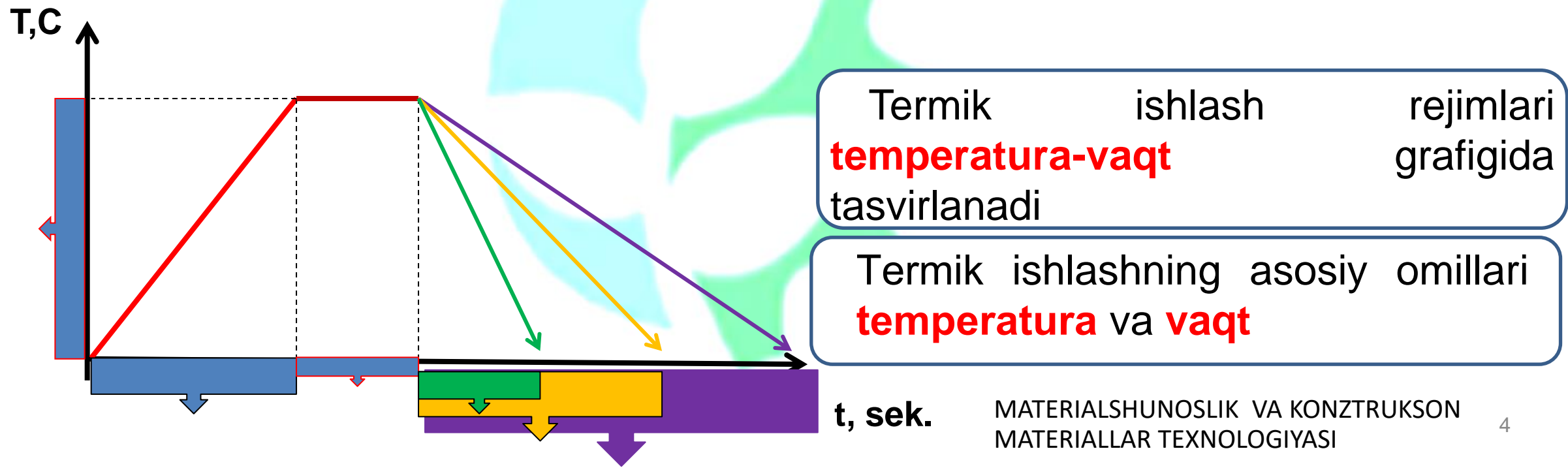
Po'latni **qizdirish temperaturasi** po'lat tarkibiga va termik ishlash turiga bog'liq. Uglrodli po'latlar uchun qizdirish temperaturasi Fe-Fe<sub>3</sub>C diagrammadan aniqlanadi, legirlangan po'latlar uchun – spravochniklardan.

Qizdirilgan po'latni **pechda tutib turish vaqti** asosan detallarning o'lchamlariga va qizdirish sharoitlariga bog'liq.

**Detallar gaz bilan yoki elektr pechlarda qizdirilsa bu vaqt quyidagicha aniqlanadi: eng katta qalinligining 1 mmga 1,5-2 min ketadi.**

**Detallar suyuq muhitlarda (masalan tuzli vannalarda) qizdirilsa bu vaqt quyidagicha aniqlanadi: eng katta qalinligining 1mmga 10-15 daqiqa ketadi.**

**Sovitish tezligi** odatda sovitish muhiti turi orqali aniqlanadi (pechda, havoda, moyda, suvda, mahsus muhitlarda sovitish).



## Termik ishlar uchun qo'llanaldigan qizdirish qurilmalari.

Termik ishlash uchun qo'llaniladigan pech – bu har xil materiallarni kerakli temperaturagacha qizdirish uchun mo'ljallangan qurilma.

Pechlarning asosiy vazifasi quyidagidan iborat:

- har xil metallarni termik ishlash;
- metall xomakilarni bosim bilan ishlash uchun qizdirish;
- metallarni eritish;



Mahalliy qizdirish



Sanoat pechi



Moyda sovitish



Kamerali pech



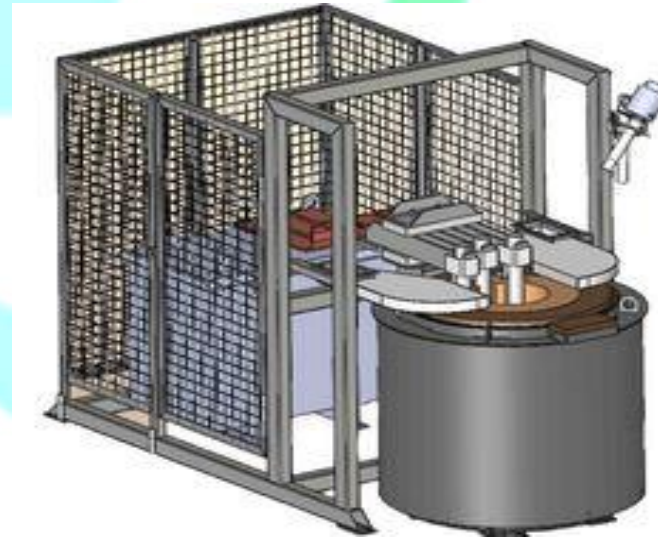
Shaxta turdagi pech



Moy va suv vannalari



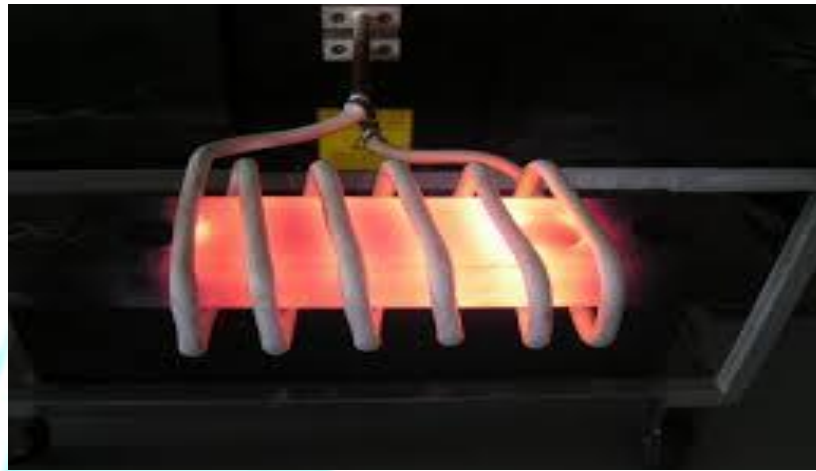
Yuvish vannalari



Tuz vannalari

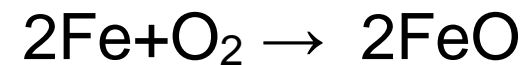
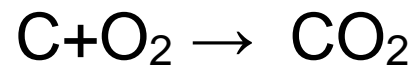


Vakuimli pech



Qizdirish jarayoni detalni bir tekis qizishini, detal darz ketmasligini hamda qizdirish qurilmalarning yukori ish unumini ta'minlash kerak.

Qizdirilgan metall sirti atrof muhit gazlari bilan reaksiyaga kirishadi va umumiy massadan 1-3% gacha kuyindiga chiqib ketadi:

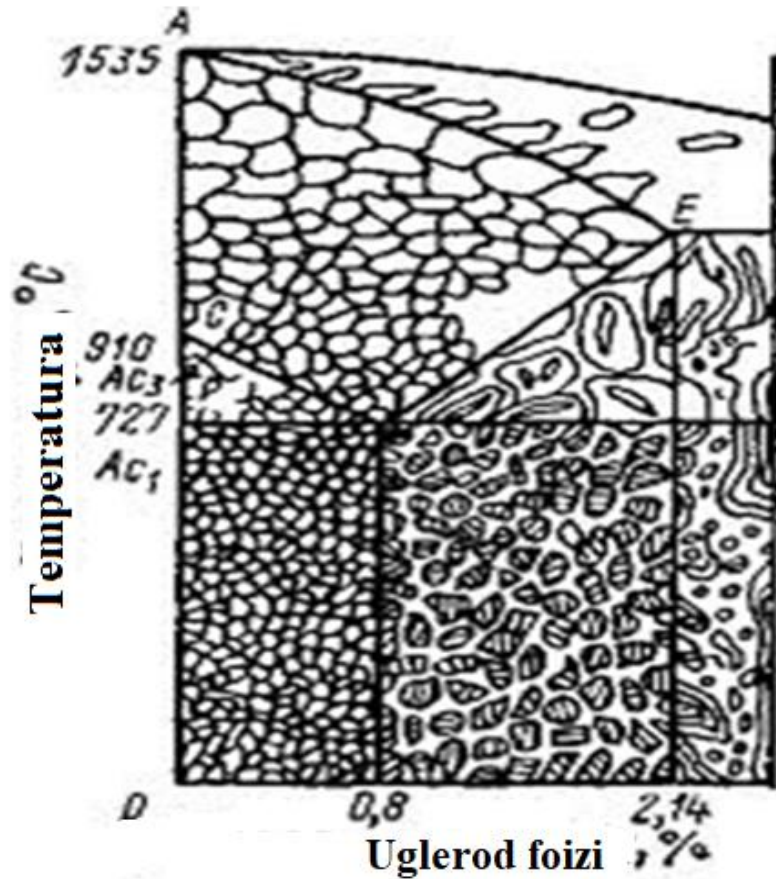


Kuyindini oldini olish uchun buyumlar suyuqliklarda (siuyq shisha, tuzlar eritmasi), vakuumda yoki inert gazlar muhitida qizdiriladi.

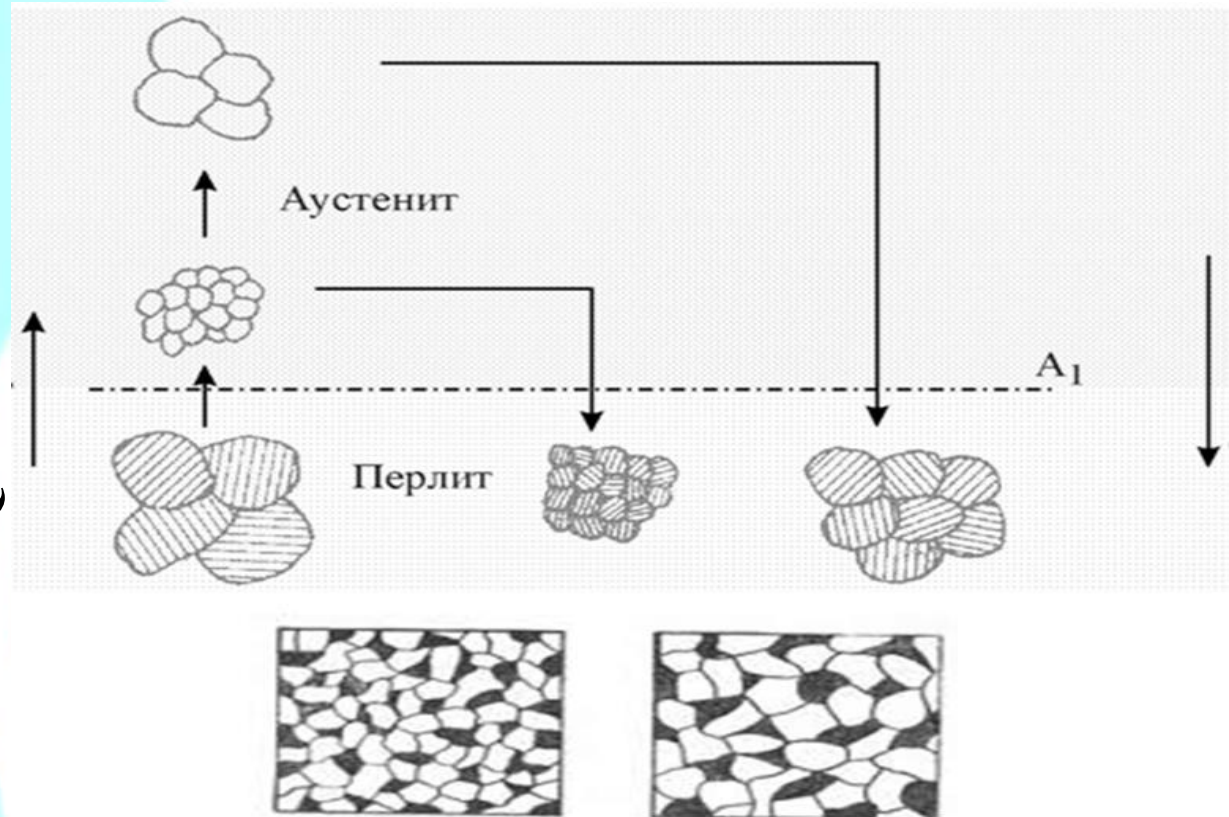




# Pōlatni qizdirish va sovitish jarayonlarda struktura o'zgarishlari.



Qizdirish ↑



↓ Sovitish

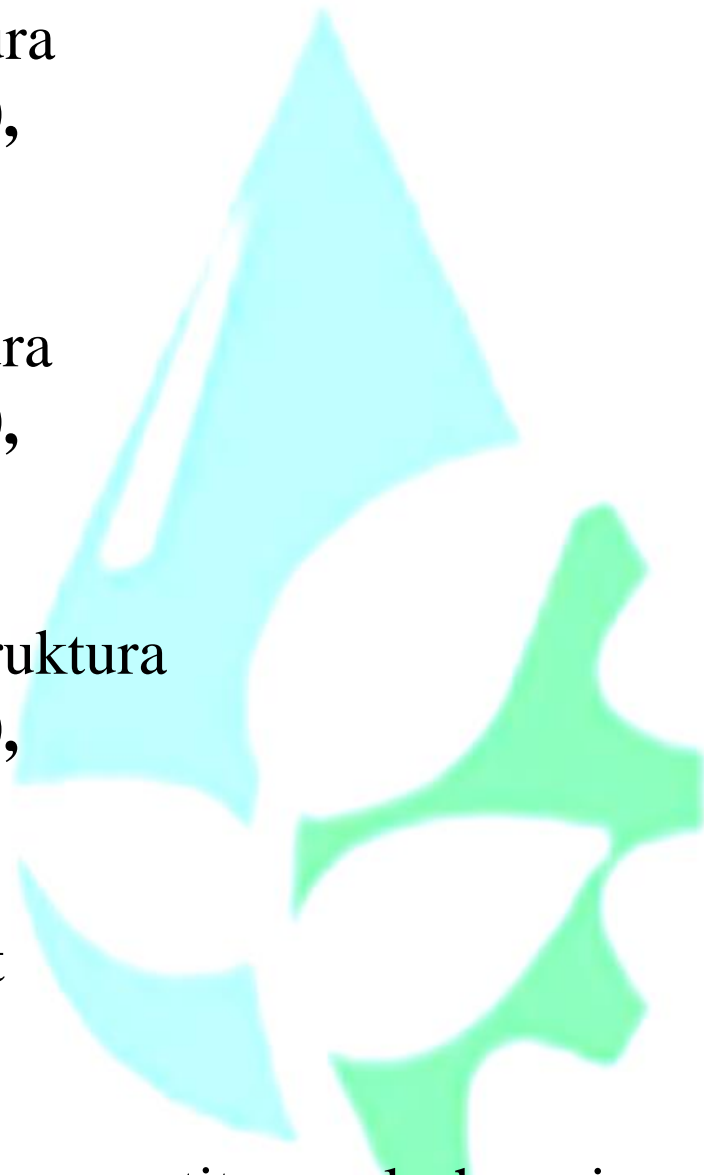
**Perlit** – yirik donali struktura  
F+S aralashmasi HRC=10,  
pechda sovutiladi.

**Sorbit** – oʻrta donali struktura  
F+S aralashmasi HRC=20,  
havoda sovutiladi.

**Troostit** – mayda donali struktura  
F+S aralashmasi HRC=30,  
moyda sovutiladi.

**Beynit** – ninasimon troostit  
F+S aralashmasi HRC=45

Bular hammasi ferrit-sementit aralashmasi  
boʻlib, **perlit oʻzgarish jarayonida** hosil boʻladi.



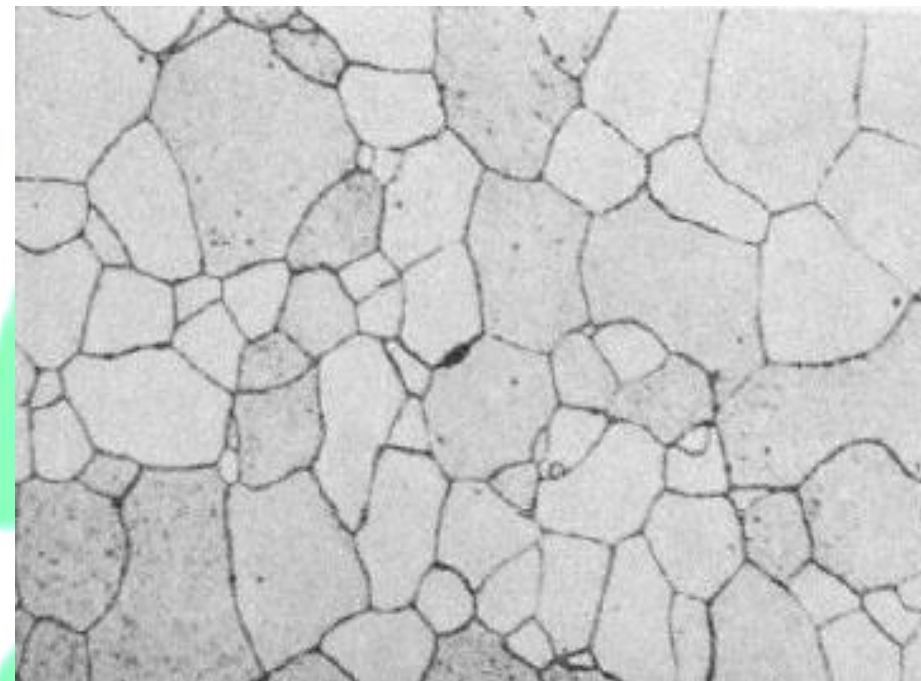
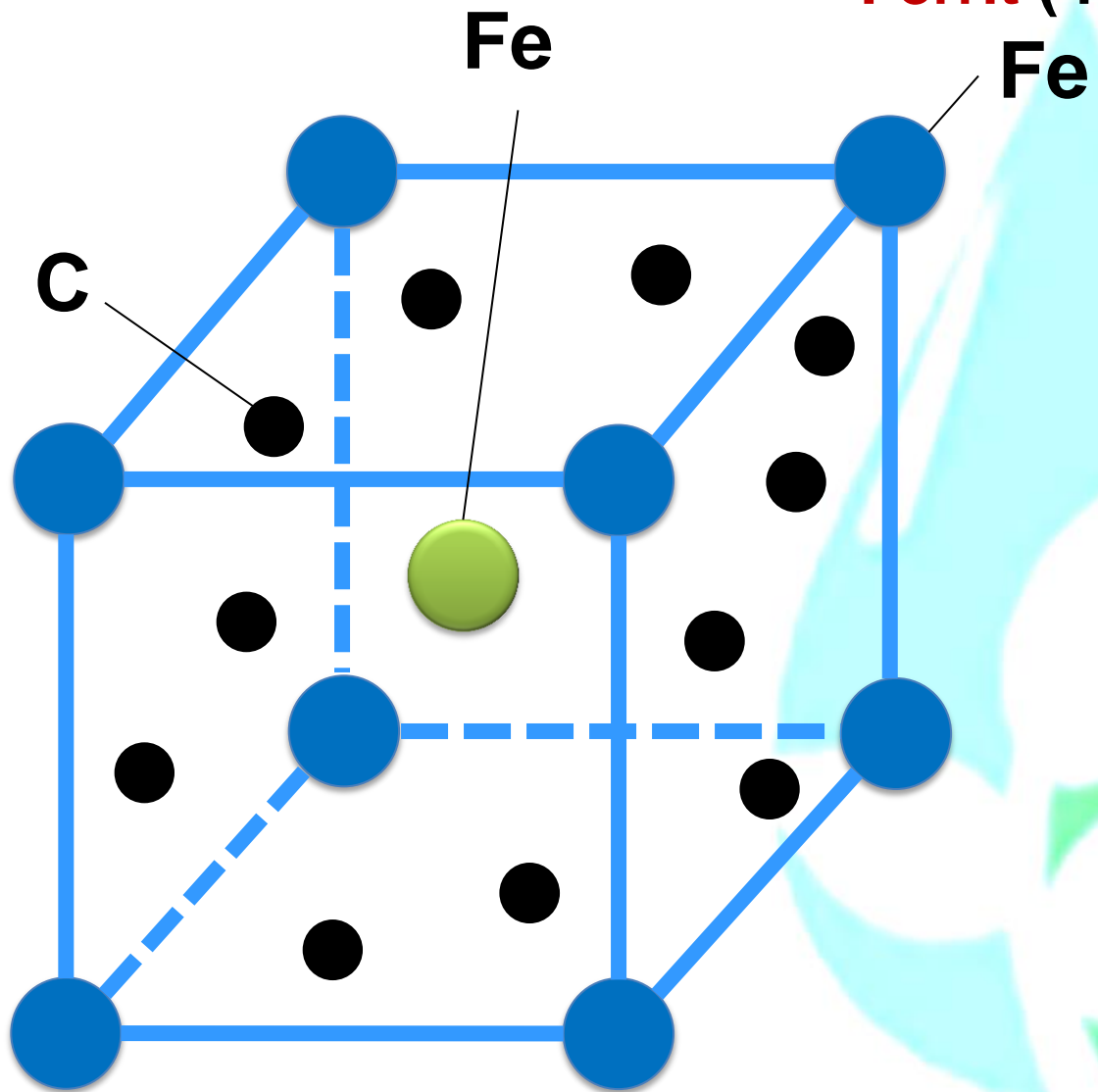
Martensit oʻzgarish  
jarayoni



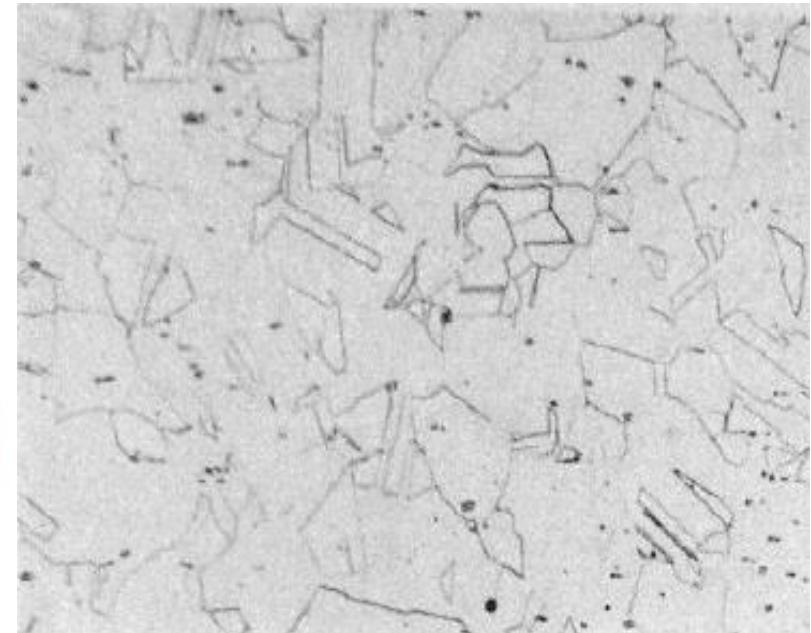
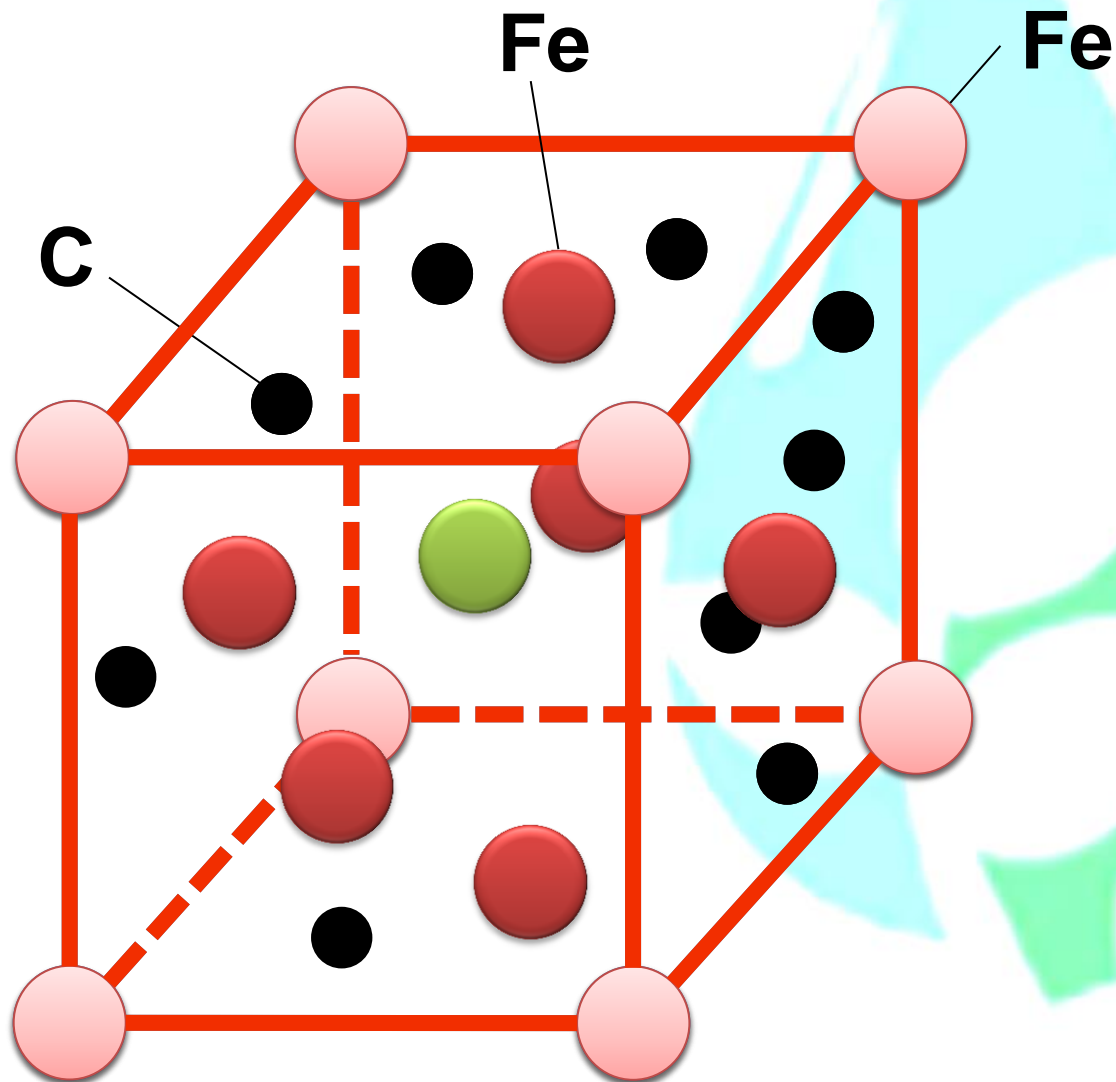
**Martensit**

uglerodga oʻta  
tōyingan  $\alpha$  - temir  
(ferrit), u juda tez  
suvda, tuzlar  
eritmasida sovutishda  
paydo bōladi.  
Qattiqligi HRC 65. U  
ninasimon tuzilishga  
ega

# Ferrit (hajmi markazlashgan kub panjara)

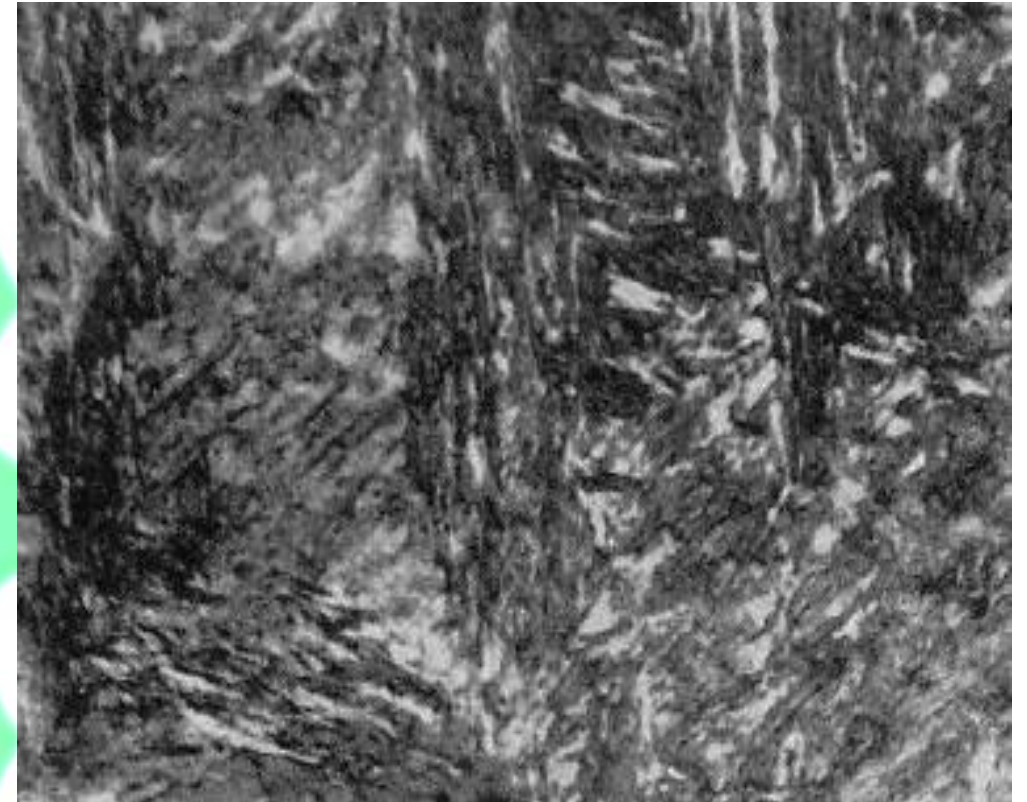
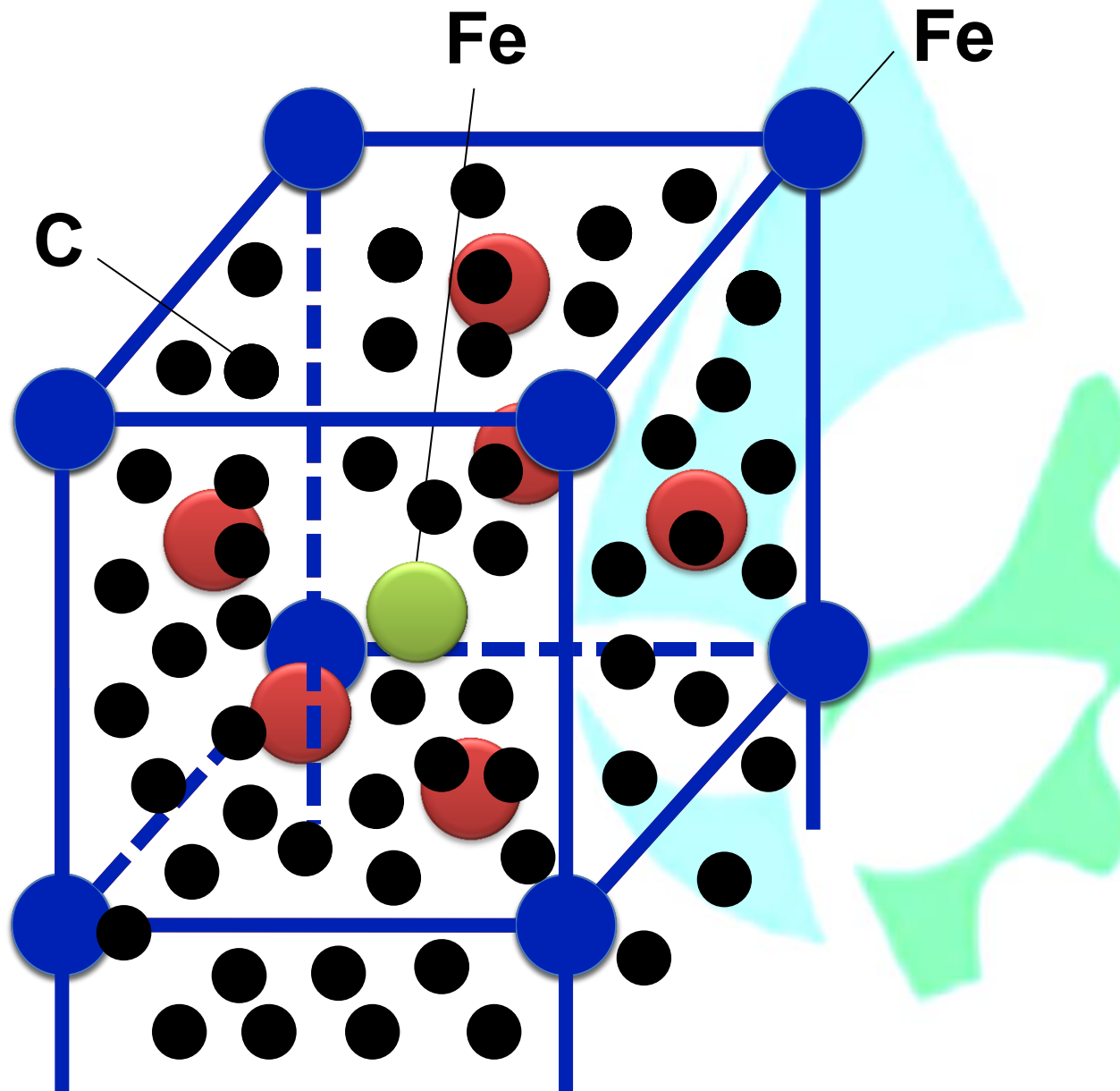


## Austenit (yoqlari markazlashgan kub panjara )

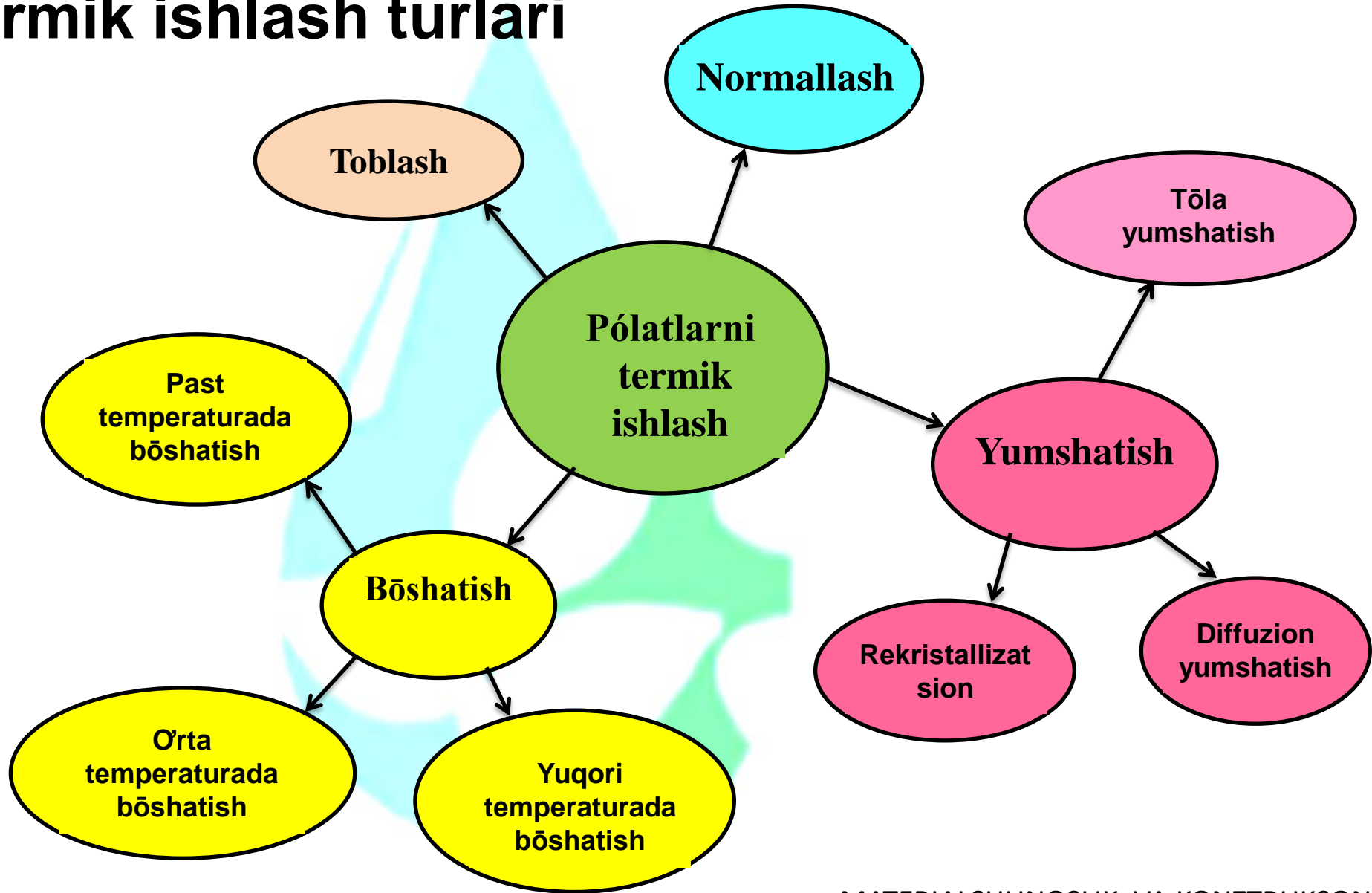


MATERIALSHUNOSLIK VA KONZTRUKSON  
MATERIALLAR TEXNOLOGIYASI

# Martentsit (hajmi markazlashgan kub panjara)

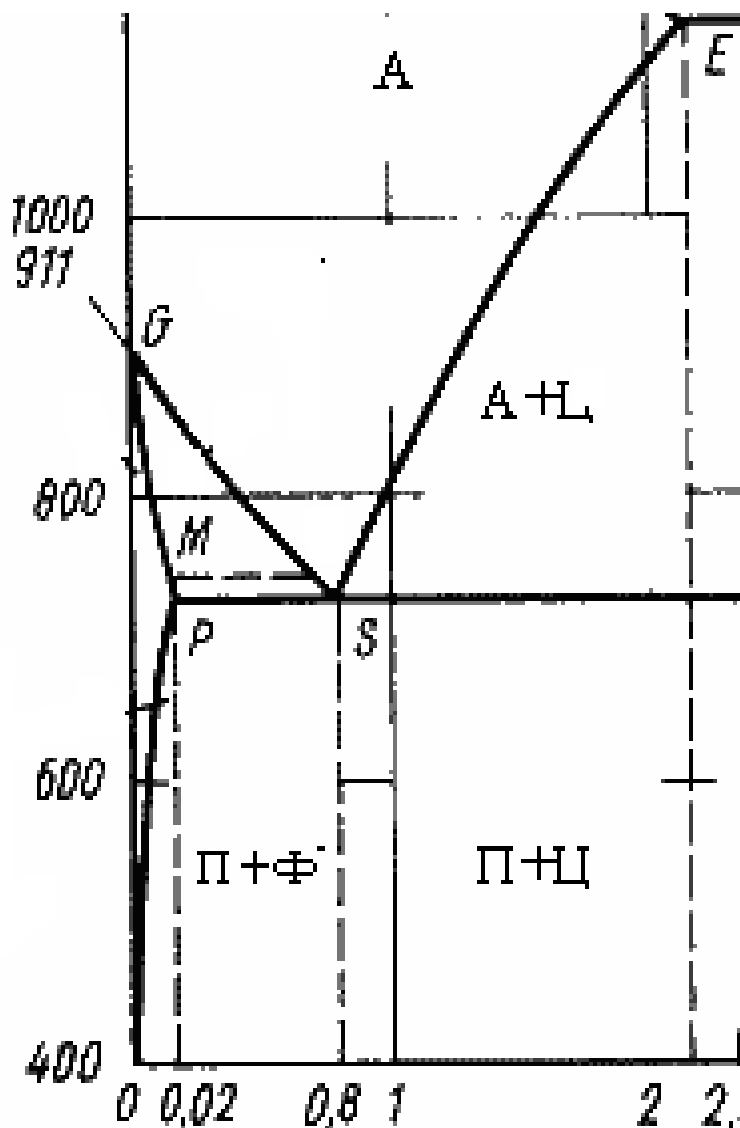


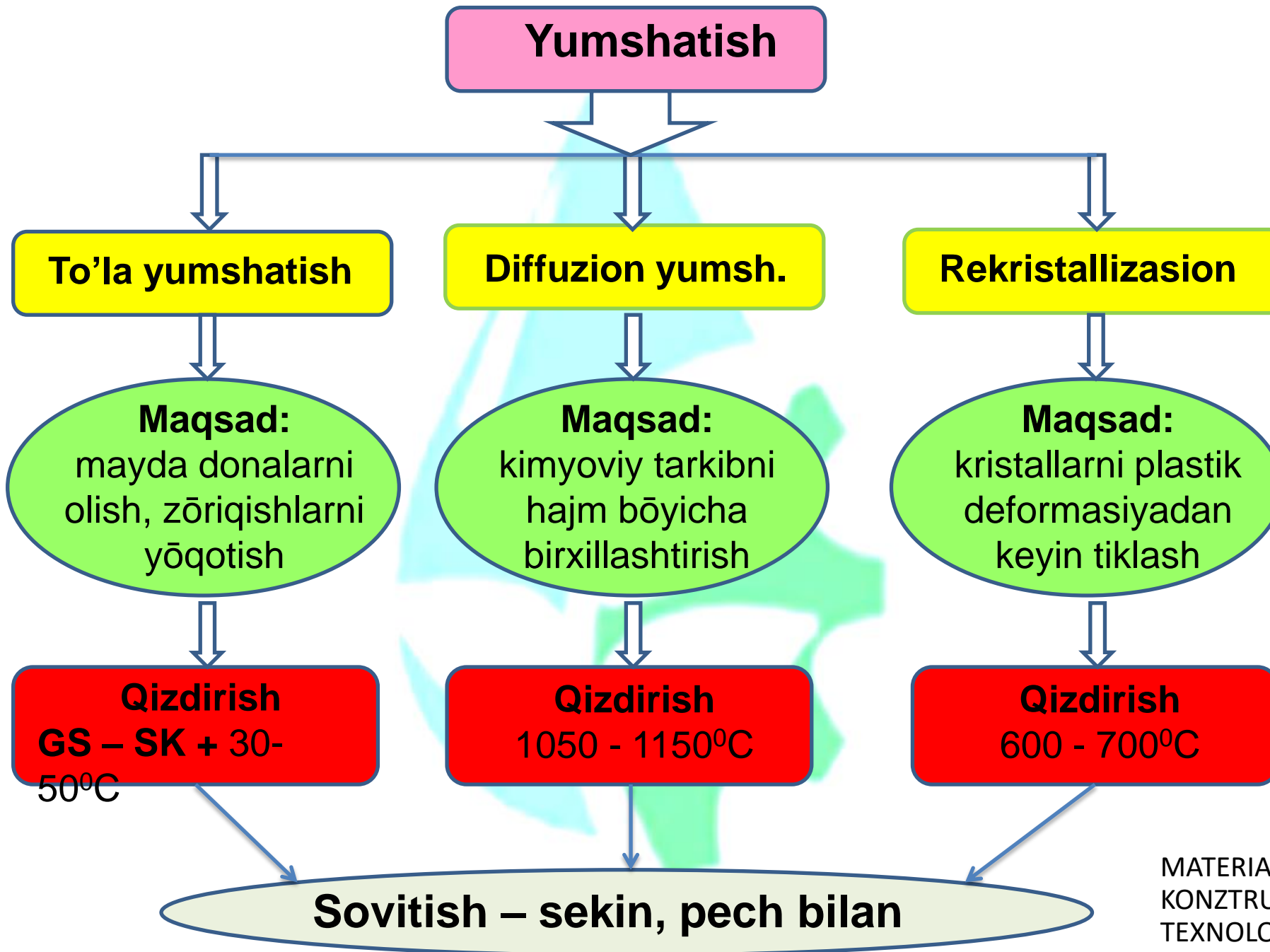
# Termik ishlash turlari



**Yumshatish** - pōatlarni **GS** - **SK** chiziqlardan 30-50<sup>0</sup>C yuqo-riroq temperaturagacha qizdirib, (**ba`zan GSK xhizig`idan past temperaturada**) ma'lum vaqt tutib, pech bilan birga (**sekin**) sovutish jarayoni.

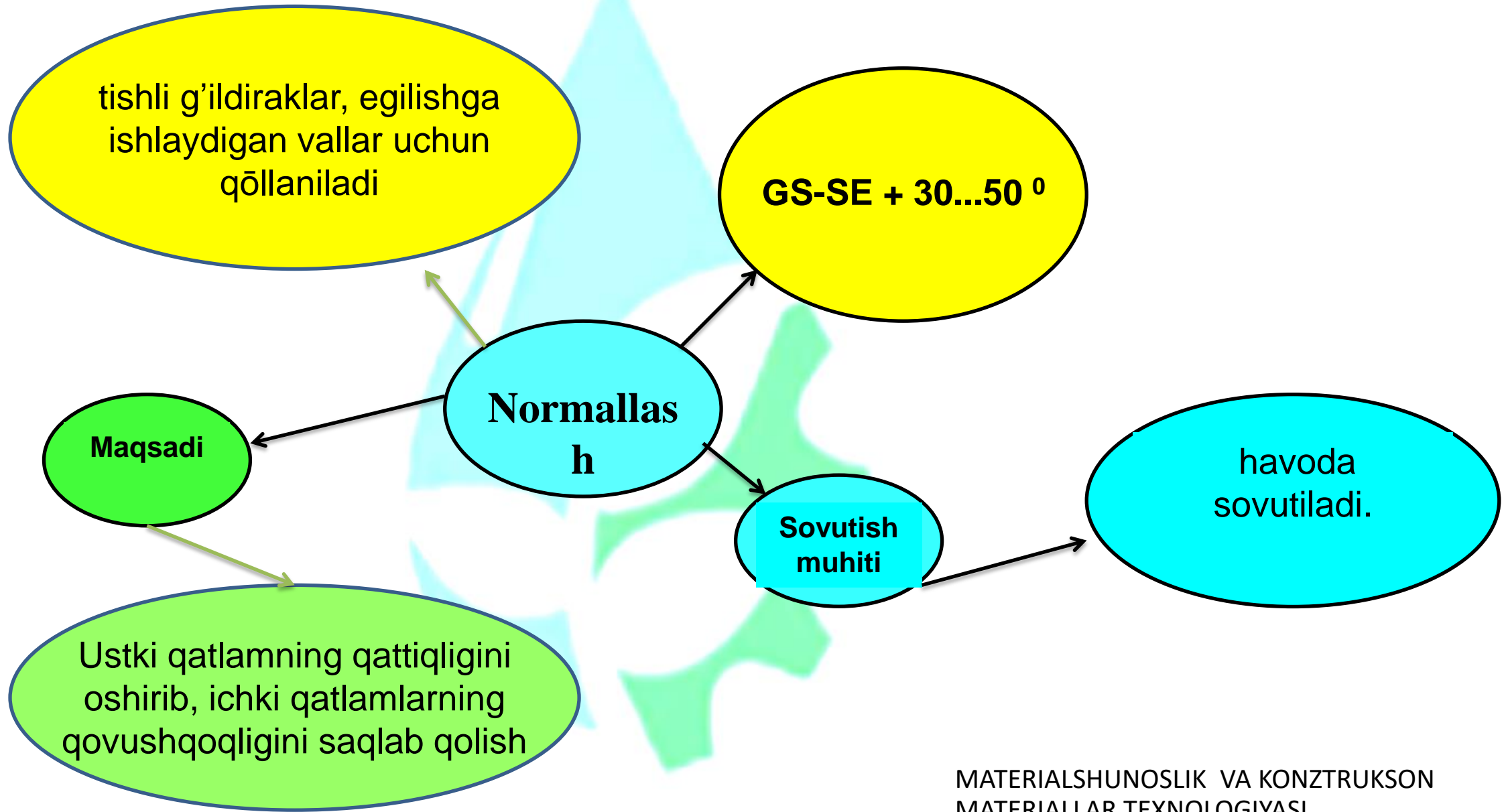
**Yumshatishning maqsadi** - yirik donli quymalar va pokovkalarining donalarini bir tekis, mayda donli qilish va ichki zōriqishlarni yōqotish, **kimyoviy tarkibini metall hajmi bōyicha birxillashtirish**, kristallar shakllarini plastik deformatsiyadan keyin tuzatish.



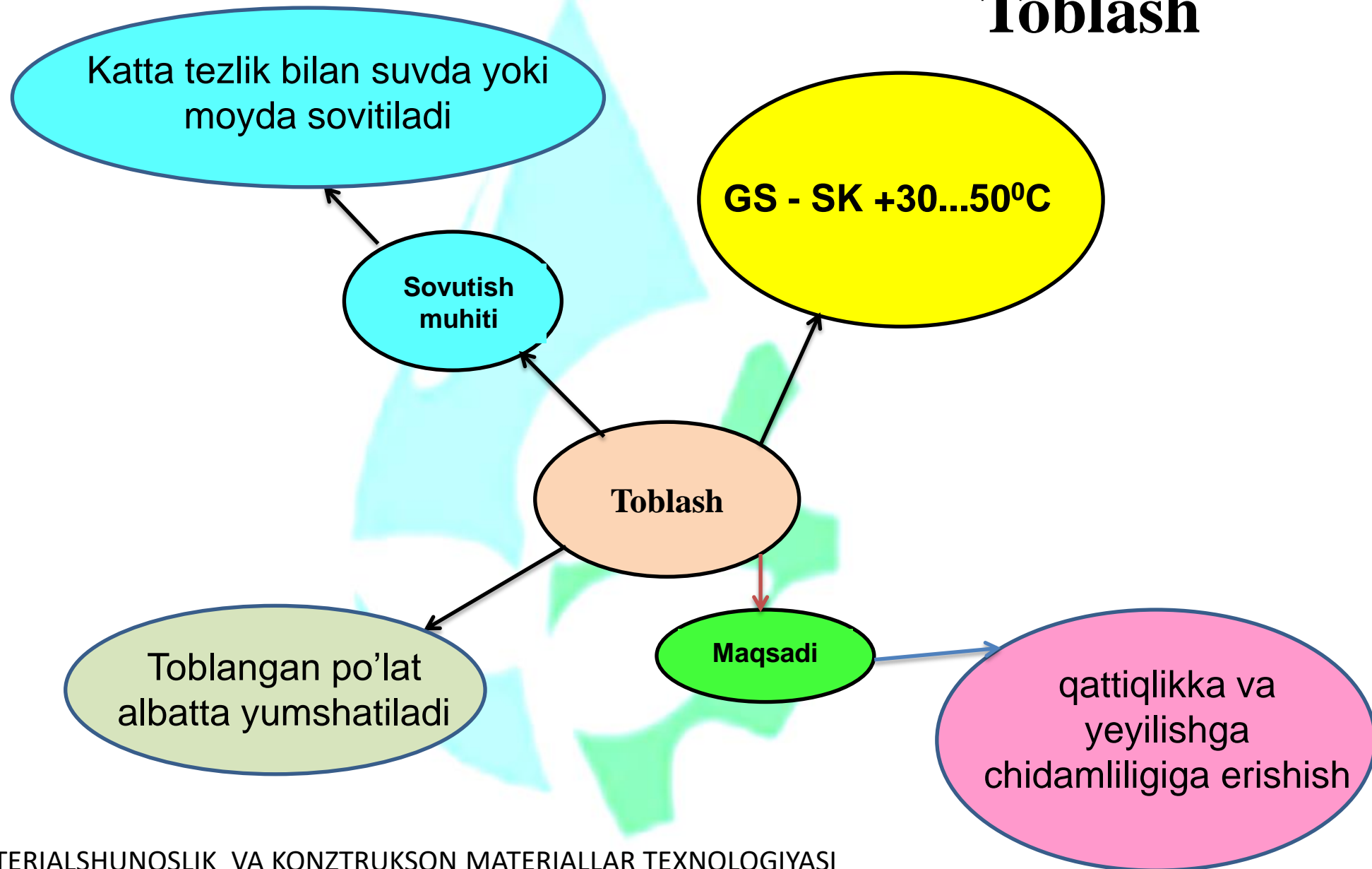




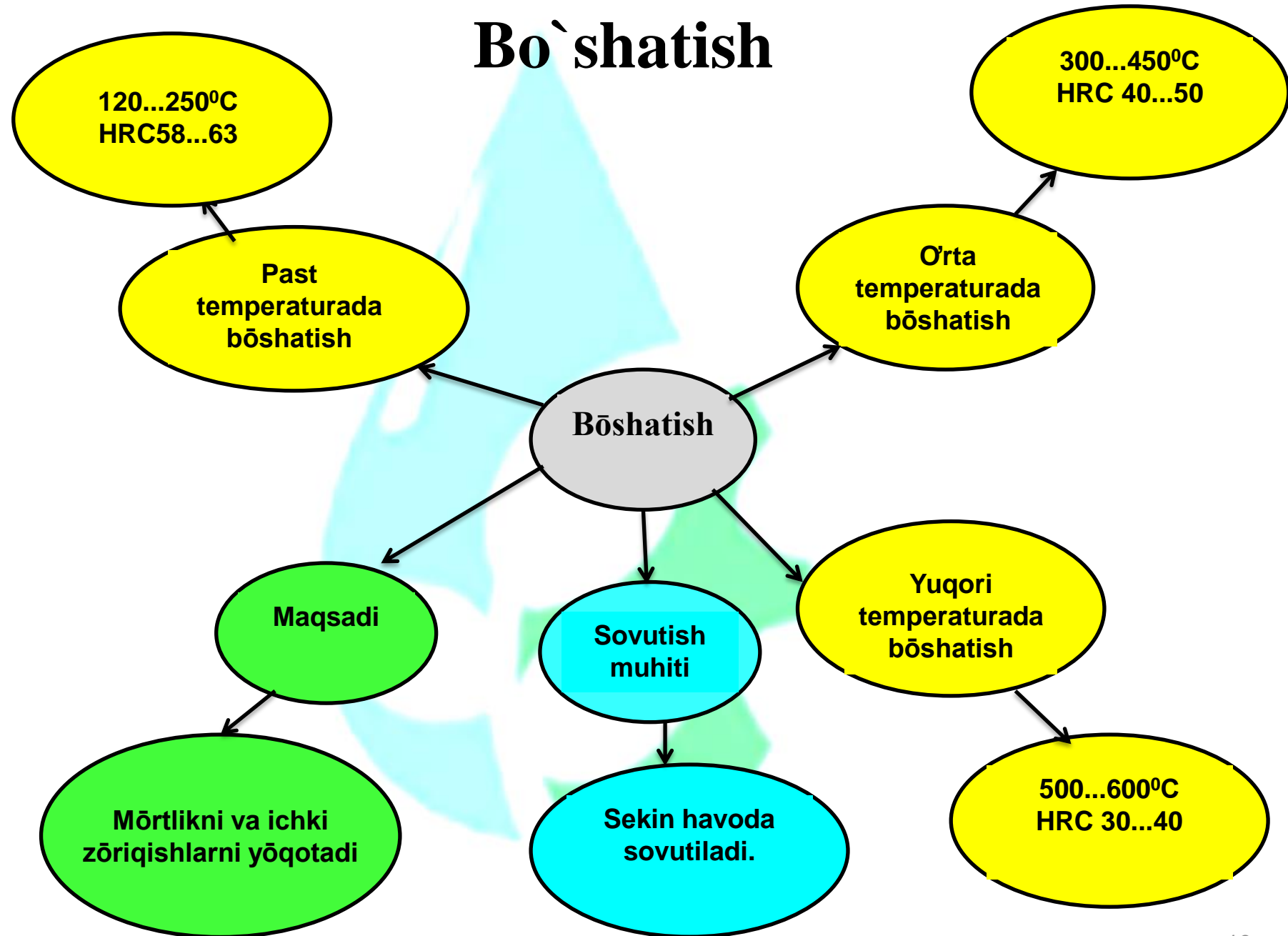
# Normallas



# Toblash



# Bo`shatish



## Nazorat savollari:

1. Termik ishlash nima? Termik ishlash rejimi kōrsatkichlarini ta'riflang.
2. Yumshatish nima va u qanday maqsadlarga yōnaltirilgan?
3. Normalash nima va u qanday maqsadlarga yōnaltirilgan?
4. Toblash nima va u qanday maqsadlarga yōnaltirilgan?
5. Bōshatish nima va u qanday maqsadlarga yōnaltirilgan?

## Adabiyotlar:

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4. <https://metinvest-smc.com/steel/>
5. <https://www.totalmateria.com/>
6. <https://www.cleverence.ru/articles/>
7. <https://www.metalinfo.ru/ru/russteel/>



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**E'TIBORINGIZ UCHUN RAHMAT!**



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