24 KASIM 2014

Kaç türlü kimyasal bağ vardır?

Bu bağların herbirinin minerallere kazandırdıkları özellikler nelerdir?

Kristallerdeki tip yapılar nelerdir?

Tip yapılardan C nun tip yapıları nelerdir?
Dizinime göre gösteriniz.

A_2X_3 Tipi yapılara örnek örnek veriniz ve şematik olarak çiziniz.

Silikat yapılarının temel birimi nedir ve nasıl kurgulanır?

BÖLÜM VI

MİNERAL KİMYASI VE MİNERALLERDE BİLEŞİMSEL DEĞİŞİMLER

Mineraller doğal, inorganik işleyler sonucu oluşan homojen, kristalin (düzenli bir atomik iç yapıya sahip), belli kimyasal ve fiziksel özellikleri olan katılardır.

Ancak kimyasal ve fiziksel özelliklerde sapmalar gözlenir.

Bileşimsel farklılıklar ve değişimlerin nedeni nedir?

Yer Kabuğunda elementlerin dağılımı

Elementler	% Ağırlık
O	46.60
Si	27.72
Al	8.13
Fe	5.0
Ca	3.63
Na	2.83
K	2.59
Mg	2.09
Ti	0.44
H	0.14
P	0.1
Mn	0.09
	99.36

Atomic Number	Element	Crustal Average
1	H	0.14%
3	Li	20
4	Be	2.8
5	B	10
6	C	200
7	N	20
8	O	46.60%
9	F	625
11	Na	2.83%
12	Mg	2.09%
13	Al	8.13%
14	Si	27.72%
15	P	0.10%
16	S	260
17	Cl	130
19	K	2.59%
20	Ca	3.63%
21	Sc	22
22	Ti	0.44%
23	V	135
24	Cr	100
25	Mn	0.09%
26	Fe	5.00%
27	Co	25
28	Ni	75
29	Cu	55
30	Zn	70
31	Ga	15
32	Ge	1.5
33	As	1.8
34	Se	0.05
35	Br	2.5
37	Rb	90
38	Sr	375
39	Y	33
40	Zr	165
41	Nb	20
42	Mo	1.5
44	Ru	0.01
45	Rh	0.005
46	Pd	0.01
47	Ag	0.07
48	Cd	0.2
49	In	0.1
50	Sn	2
51	Sb	0.2
52	Te	0.01
53	I	0.5
55	Cs	3
56	Ba	0.04%
57	La	30
58	Ce	60
59	Pr	8.2
60	Nd	28
62	Sm	6.0
63	Eu	1.2
64	Gd	5.4
65	Tb	0.9
66	Dy	3.0
67	Ho	1.2
68	Er	2.8

Atomic Number	Element	Crustal Average
69	Tm	0.5
70	Yb	3.4
71	Lu	0.5
72	Hf	3
73	Ta	2
74	W	1.5
75	Re	0.001
76	Os	0.005
77	Ir	0.001
78	Pt	0.01
79	Au	0.004
80	Hg	0.08
81	Tl	0.5
82	Pb	13
83	Bi	0.2
90	Th	7.2
92	U	1.8

Bu 12 elementin dışındaki elementlerin önemli bir kısmı kendi minerallerini oluşturamazlar.

Çoğunlukla diğer minerallerin içinde dağılmış olarak yer alırlar veya yer kabuğunda zaten az bulunurlar.

Bileşimsel Farklılıklar:

- Bir yapıda iyon, atom ve iyon guruplarının yerini diğer atom, iyon ve iyon gurupları alırsa, veya bunlar atomlar arası boşluğa yerleşirse, mineralin yapısında bileşimsel farklılıklar olur. Bu katı çözeltidir. Bu izomorf minerallerde daha yaygın olarak oluşur. Katı çözelti oluşturma kriterleri:

  1) Atom, iyon ve iyon guruplarının yapıdaki boyutlarına göre:

  -%0-15 boyut farkı tam katı çözelti

  -%15-30 " " kısmi katı çözelti

  -%30 da büyük ise hiç veya çok az katı çözelti oluşturur.

  2) İyonların yük benzerliği(Fe^{+2} =Mg^{+2}),(Al^{+3} = Si^{+4} + □)

  3) Yer alma sırasındaki sıcaklığa bağlıdır.

Katı Çözelti oluşturma mekanizmaları:

1. **Ornatmalı (substitutional)katı çözelti**
   -Basit katyonik veya anyonik ornatma
   Kısmi katı çözelti, Tam Katı çözelti
   -Çift katyonik ornatma
   Kısmi çift ornatmalı katı çözelti (piroksenler)
   Tam çift ornatmalı katı çözeltiler (pilajioklazlar)
2. **Atomlar arasına yerleşmeli katı çözeltiler (interstitial)**
3. **Terkedilme (boş bırakma) sonucu olan katı çözeltiler (omission)**

1. Ornatmalı (substitutional) katı çözelti:

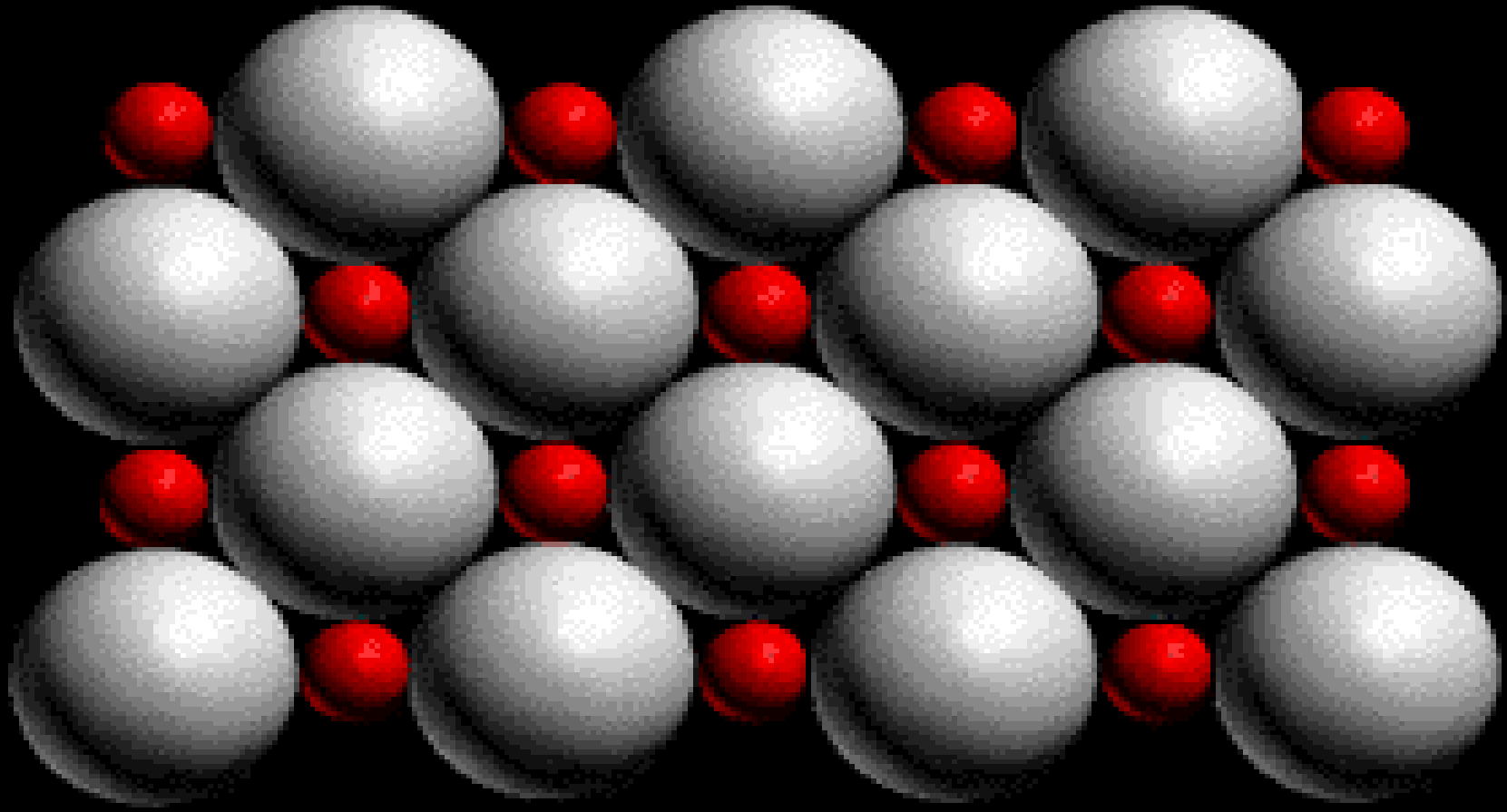
-Basit katyonik veya anyonik ornatma

A^+X^- bileşiğinde B^+, A^+yı kısmen veya tamamen ornatır(katyonik ornatma).

A^+X^- de Y^- , X^- kısmen veya tamamen ornatır(anyonik).

Anyonik ornatmada : Br^-, Cl^- anyonunu KCl yapısında ornatır.

A^+X^-



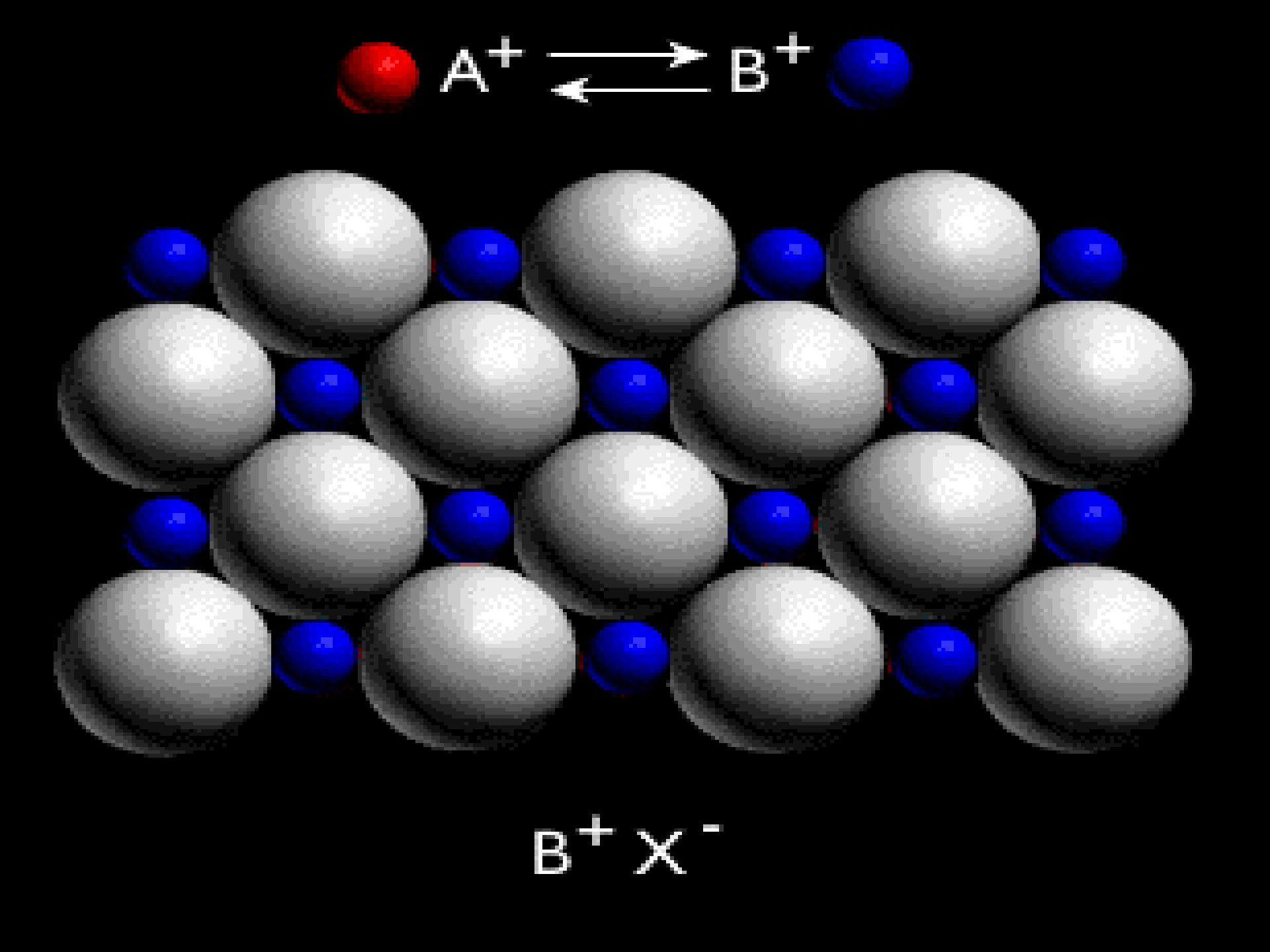
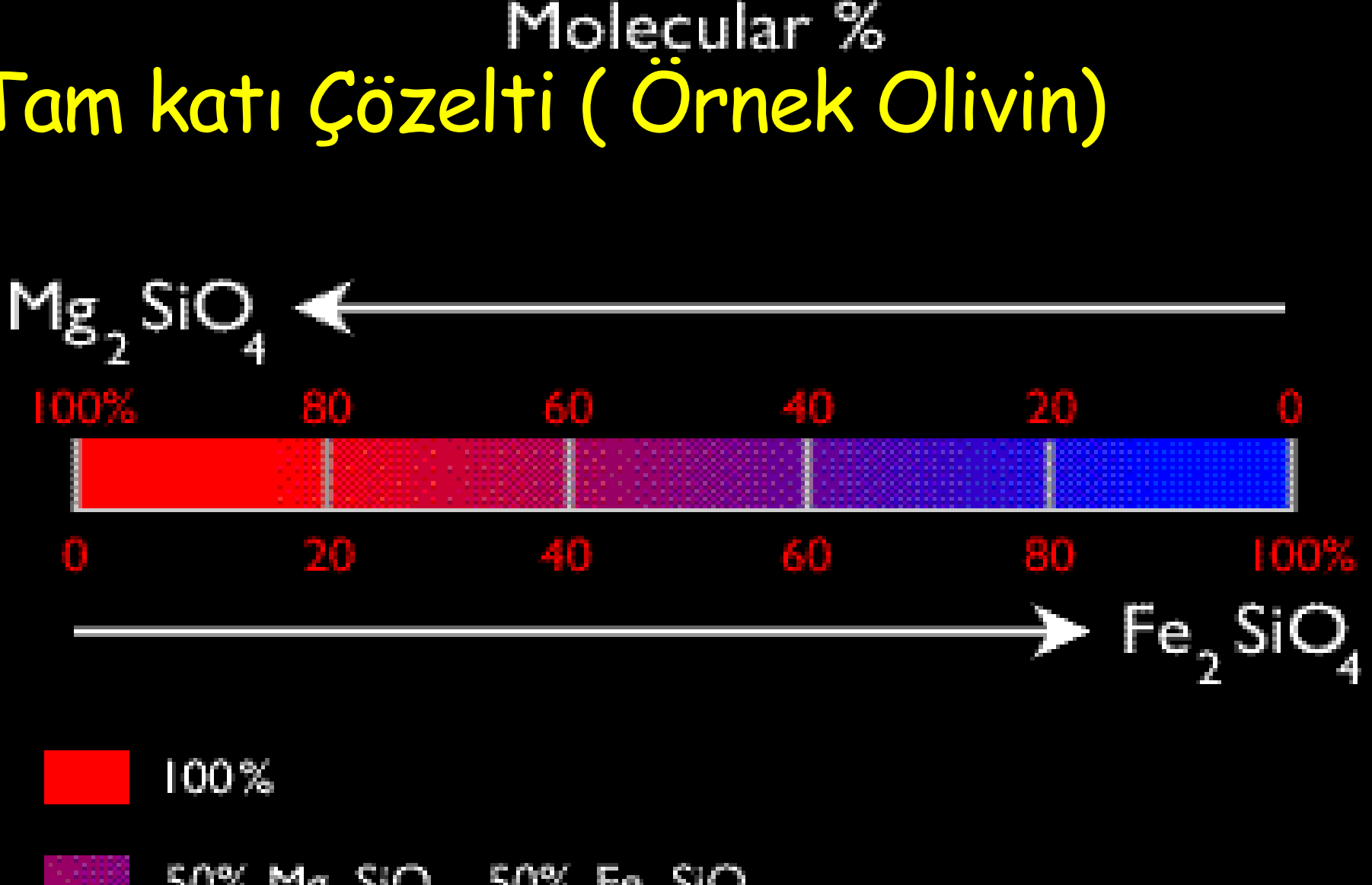

A+
B+
B+ X-

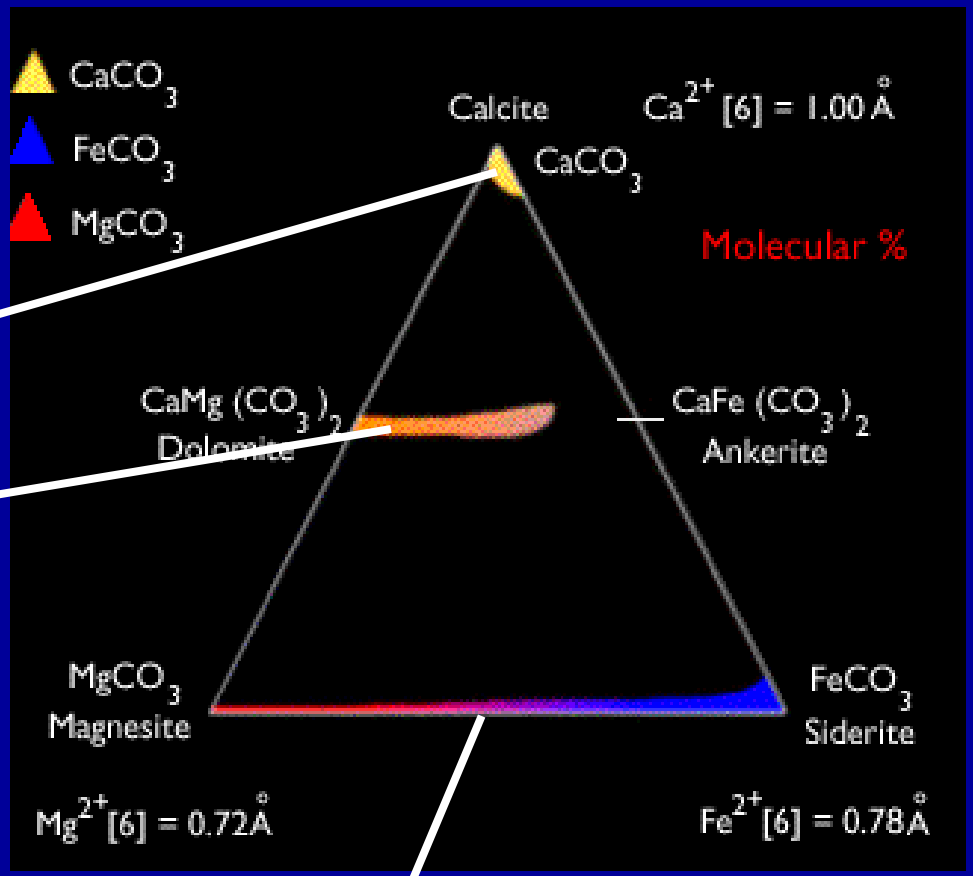
TABLE 1-6 Common Ionic Substitution Pairs

Ion	CN	Radius (pm)	Ion	Radius (pm)
Mg	VI	80	Fe^{2+}	86
Al	IV	47	Si	34
F	VI	125	O	132
Ba	IX	155	K	163
Ge	IV	48	Si	34
Ga	VI	70	Al	61
Hf	VIII	91	Zr	92
Mn^{4+}	VI	62	Fe^{3+}	73
Mn^{2+}	VI	91	Fe^{2+}	86
La–Lu	VIII	126–105	Ca	120
Na	VIII	124	Ca	120

Tam katı Çözelti (Örnek Olivin)



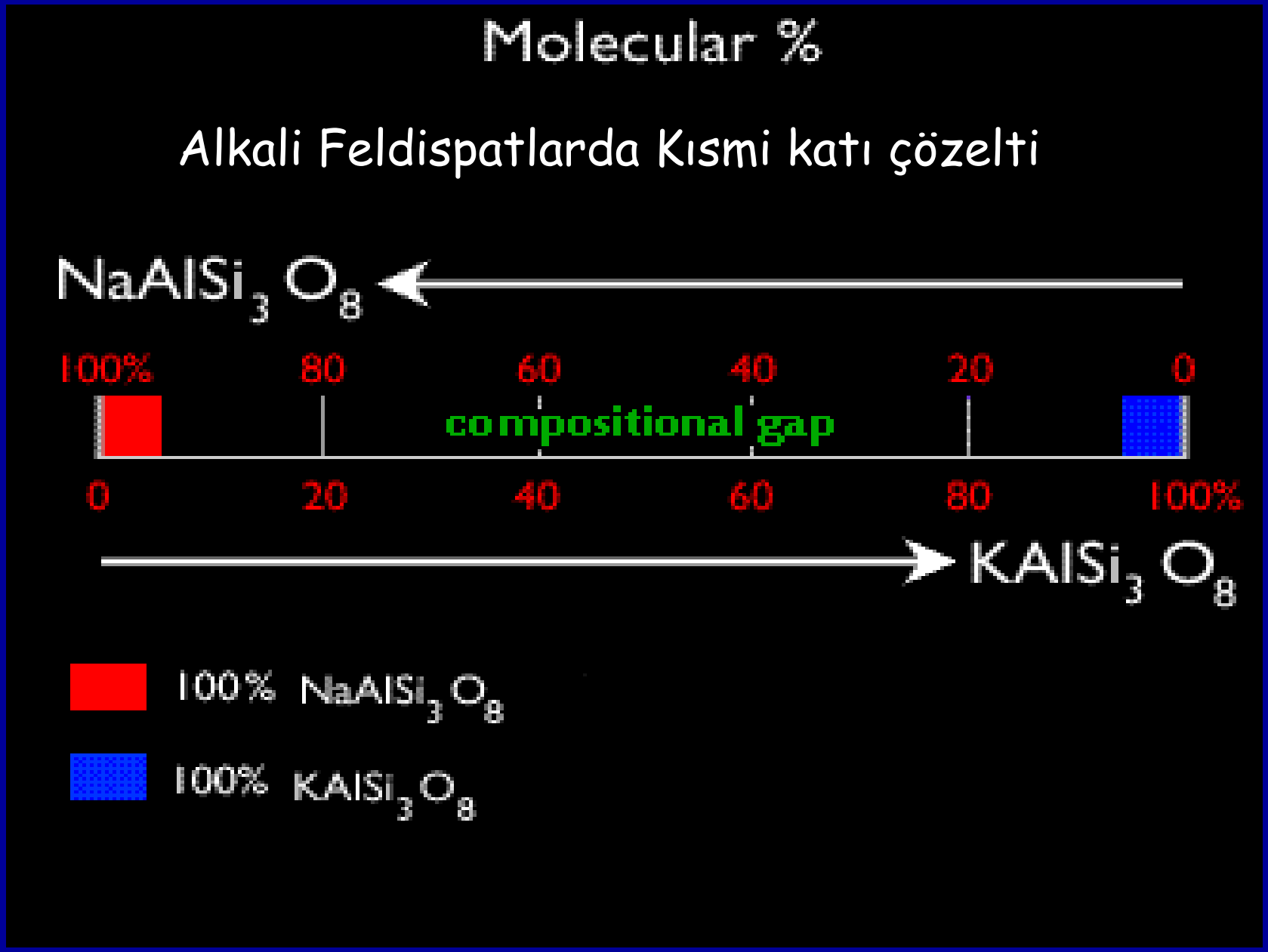
Tam, kısmi ve katı çözeltisiz sistem



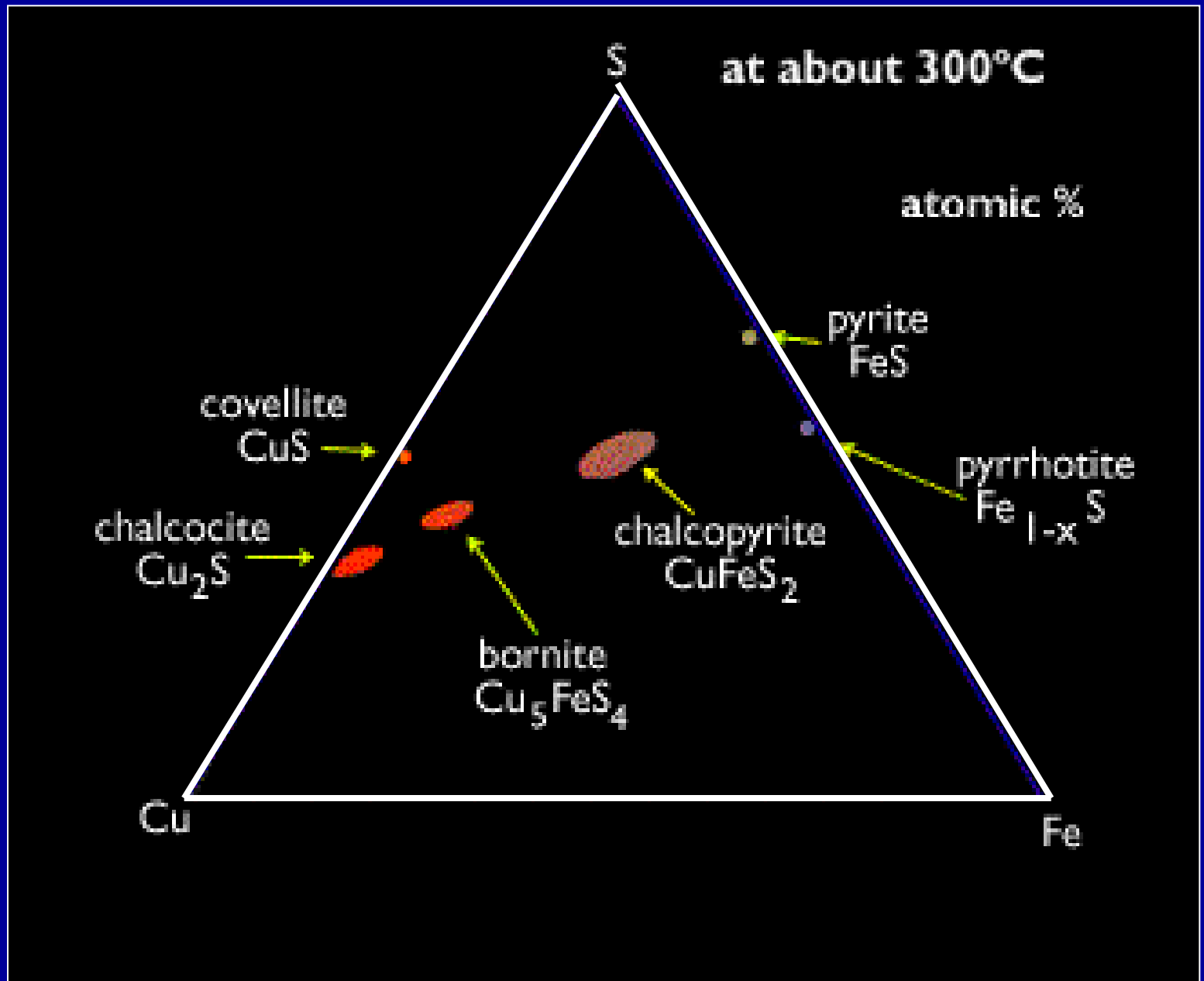
Kısmi katı çözelti

Tam Katı çözelti

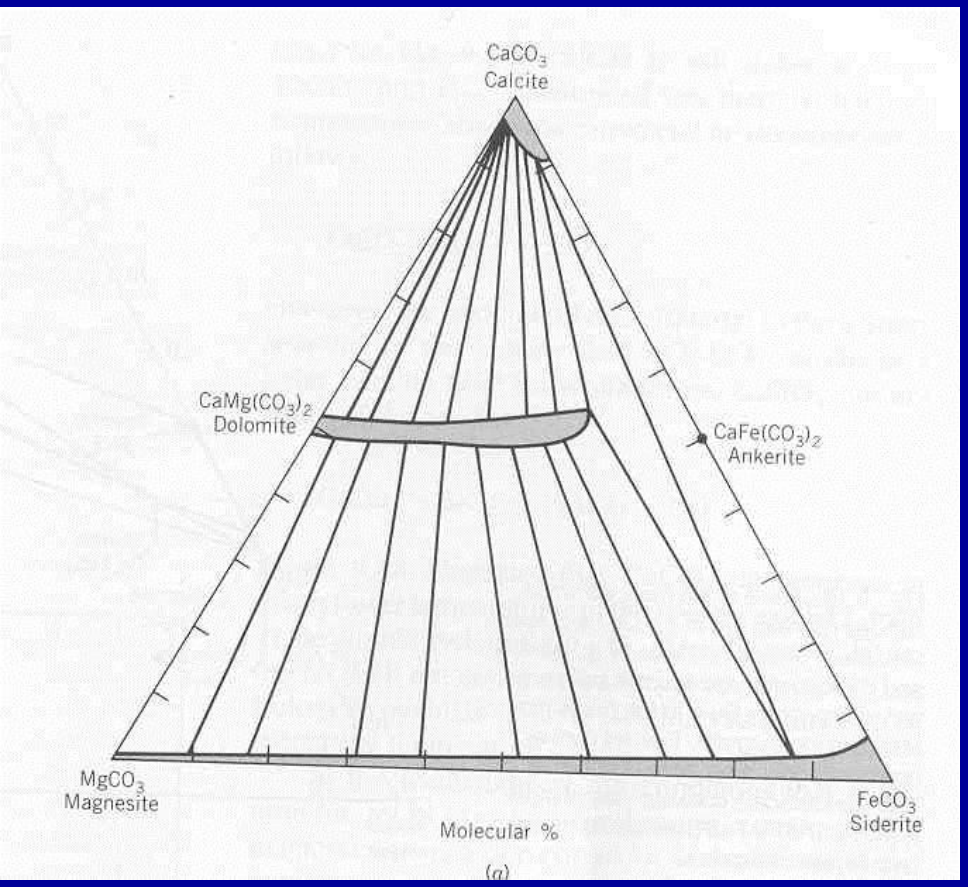
Kısmi katı çözelti

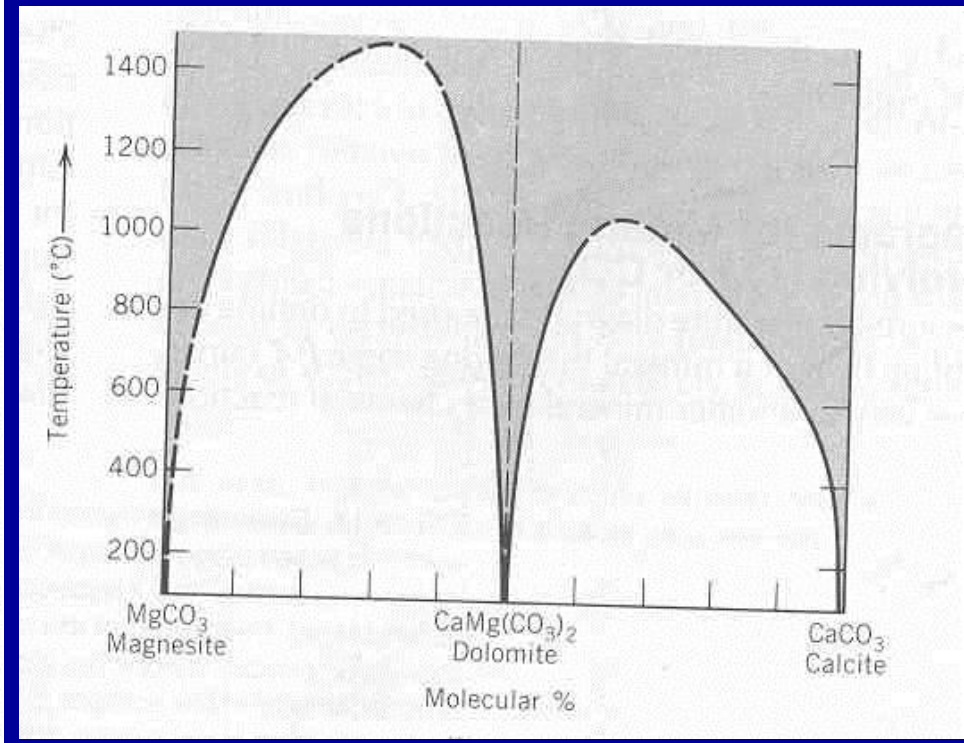


Katı çözeltisiz sistem

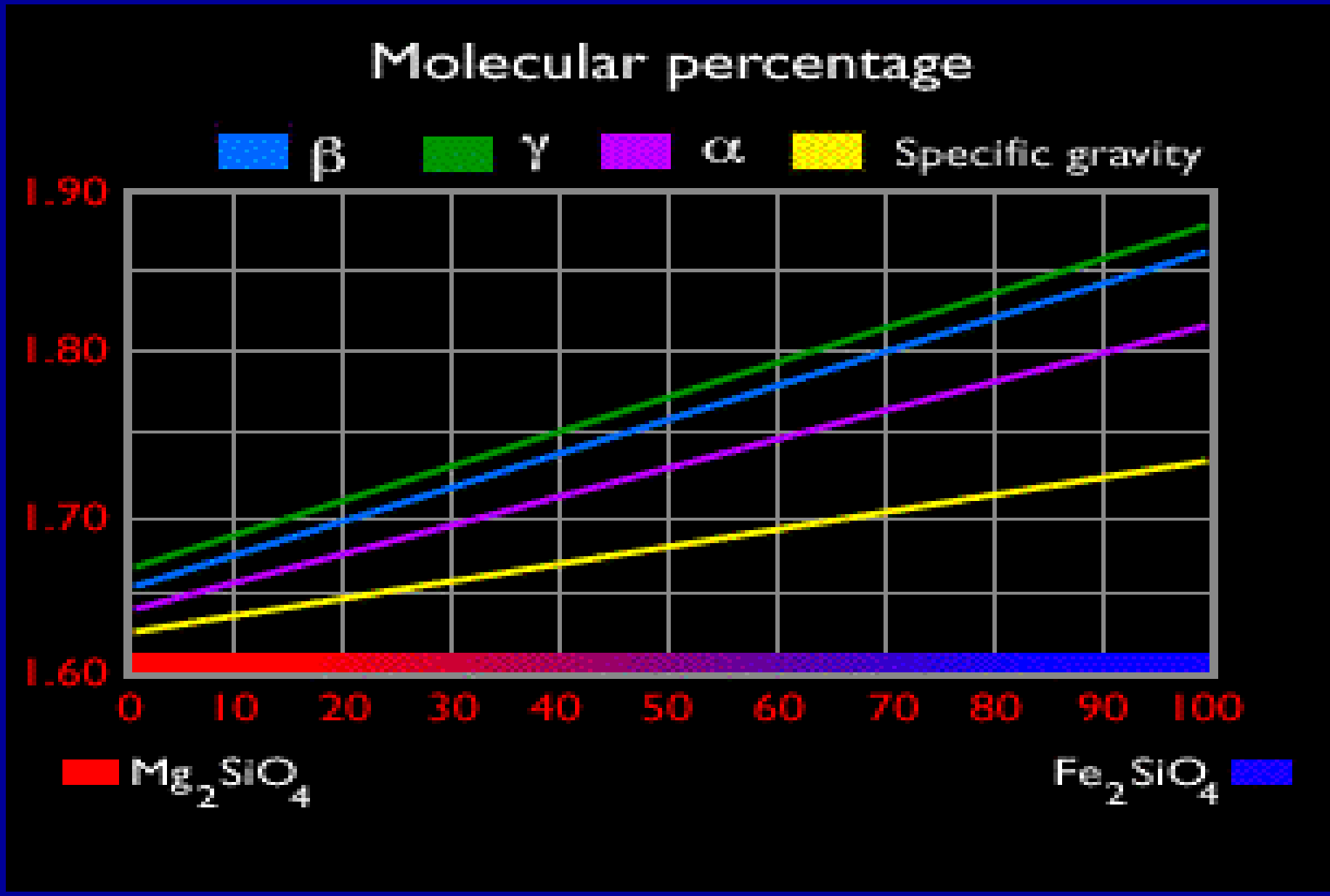


Sıcaklığın katı çözeltiye etkisi





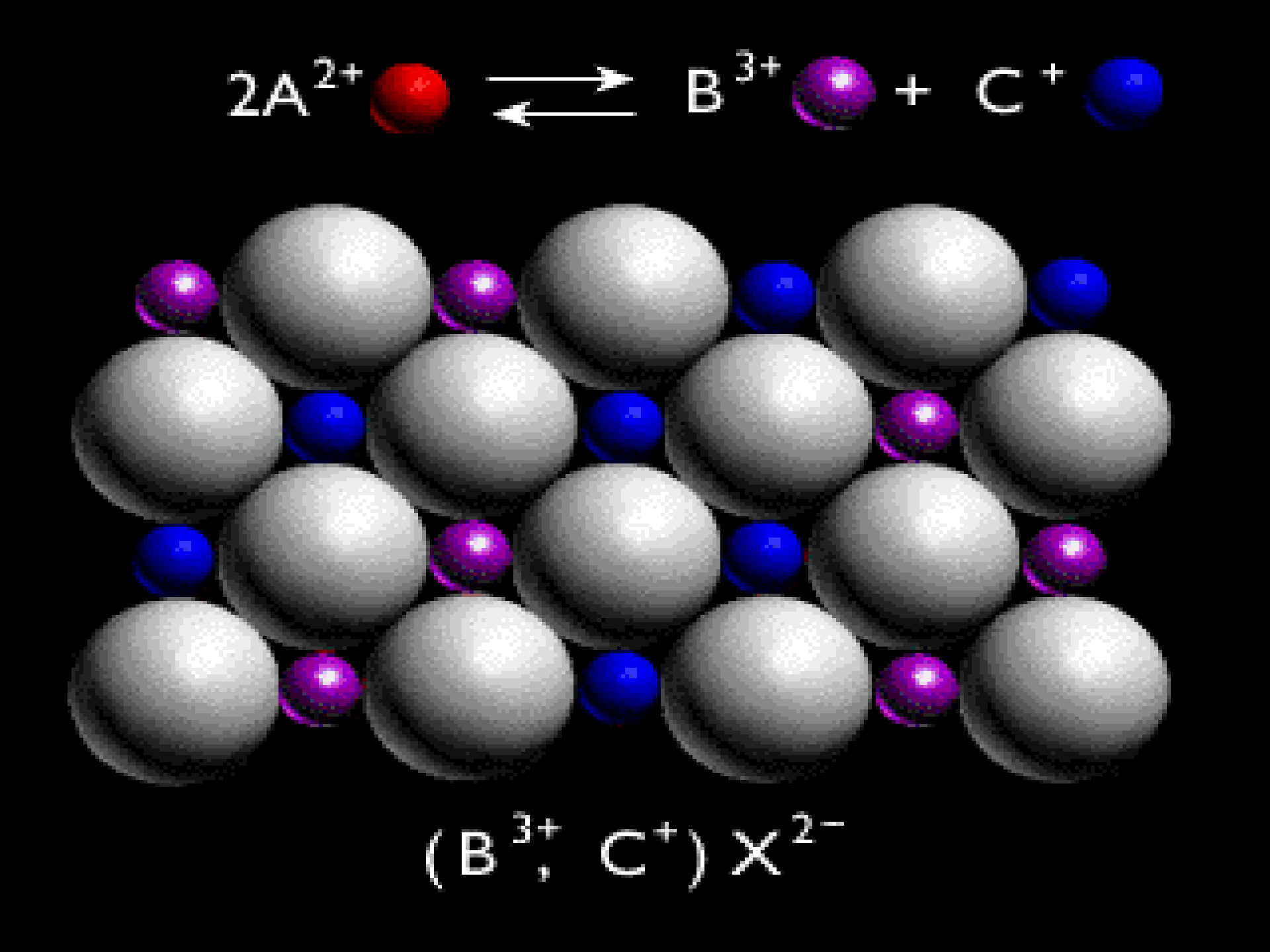
Katı çözelti ve fiziksel özelliğin değişimi



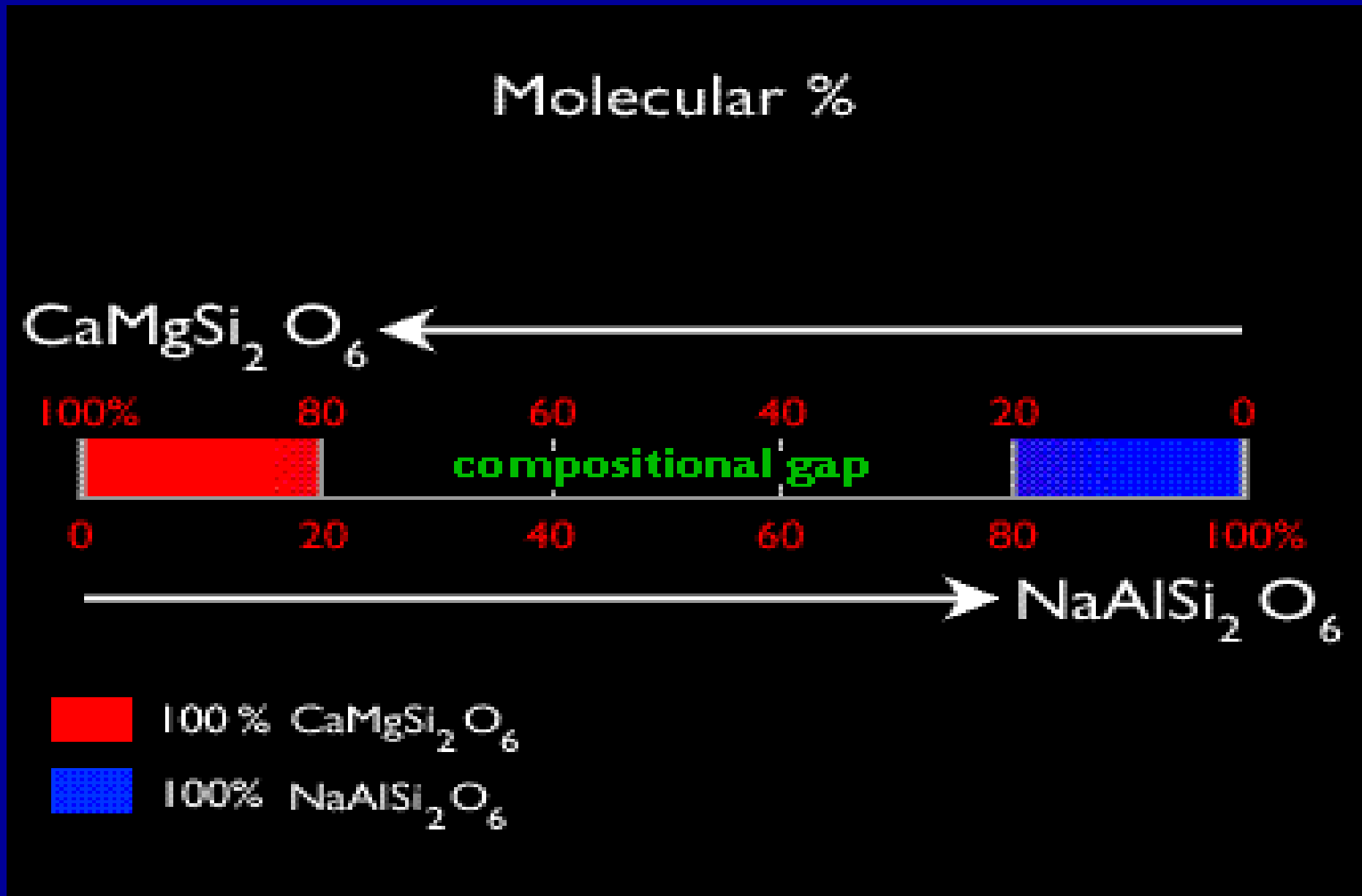
-Çift katyonik ornatma:

$A^{+2}X^{-2}$ de B^{+3}, A^{+2} yi ornatır . Elektriksel nötrallik için C^{+}, B^{+3}ile birlikte yapıda yer alır.

$2A^{+2}=1B^{+3} + 1C^{+}$


2A 2+
B 3+
+
C +
(B 3+, C +) X 2−

Kısmi çift ornatmalı katı çözelti (piroksenler)



Example of coupled sustitution in the plagioclase feldspar series:

$$Na^{+}Si^{4+} \rightleftharpoons Ca^{2+}Al^{3+}$$

$$5^{+} \rightleftharpoons 5^{+}$$

Ionic sizes:

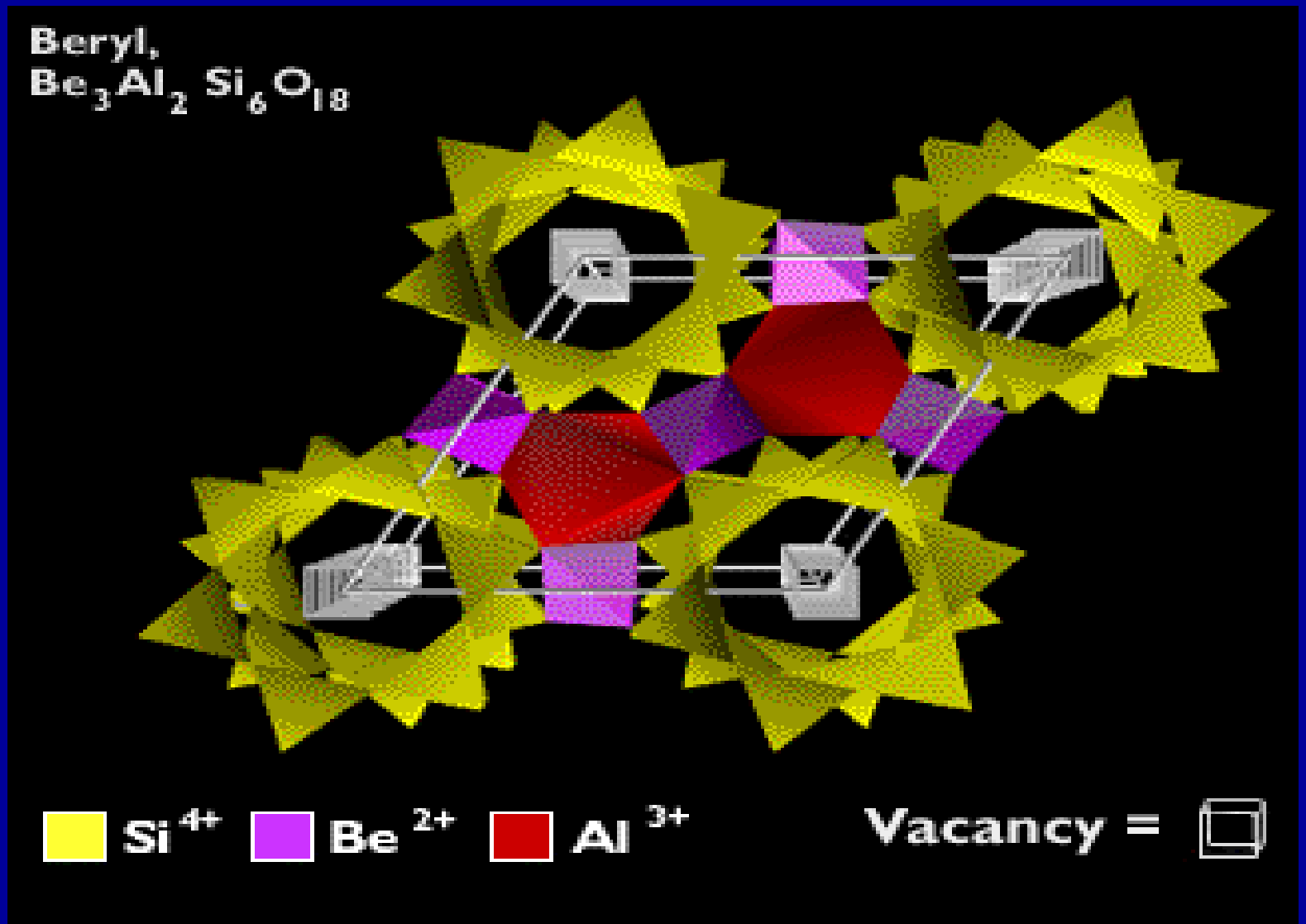
Na^{+}	[8]	=	1.18 Å
Ca^{2+}	[8]	=	1.12 Å
Si^{4+}	[4]	=	0.26 Å
Al^{3+}	[4]	=	0.39 Å

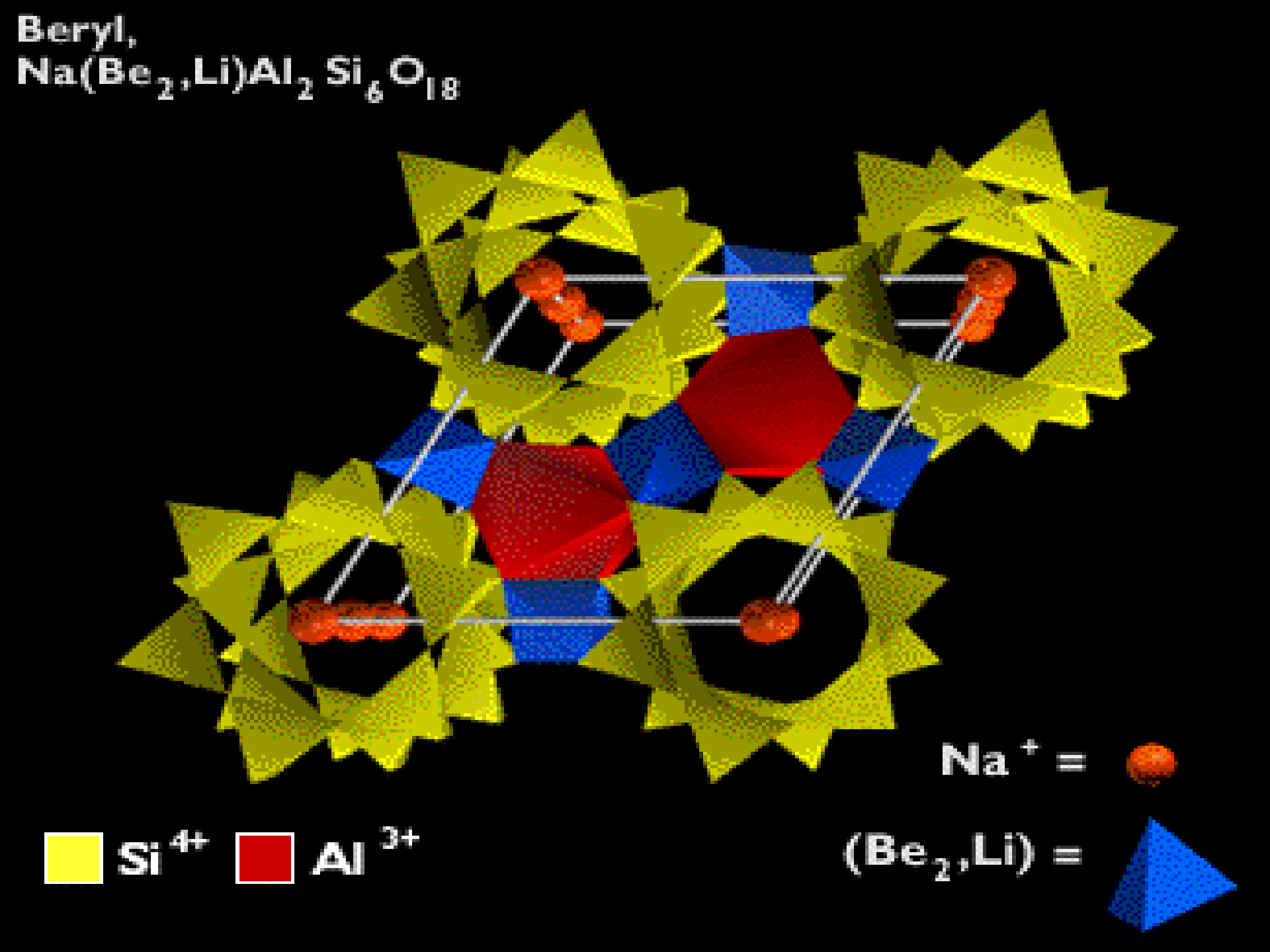
Plagioclase series end members:

albite - $Na(Al\ Si_3)O_8$

anorthite - $Ca(Al\ Al\ Si_2)O_8 = CaAl_2Si_2O_8$

2. Atomlar arasına yerleşmeli katı çözeltiler (interstitial)

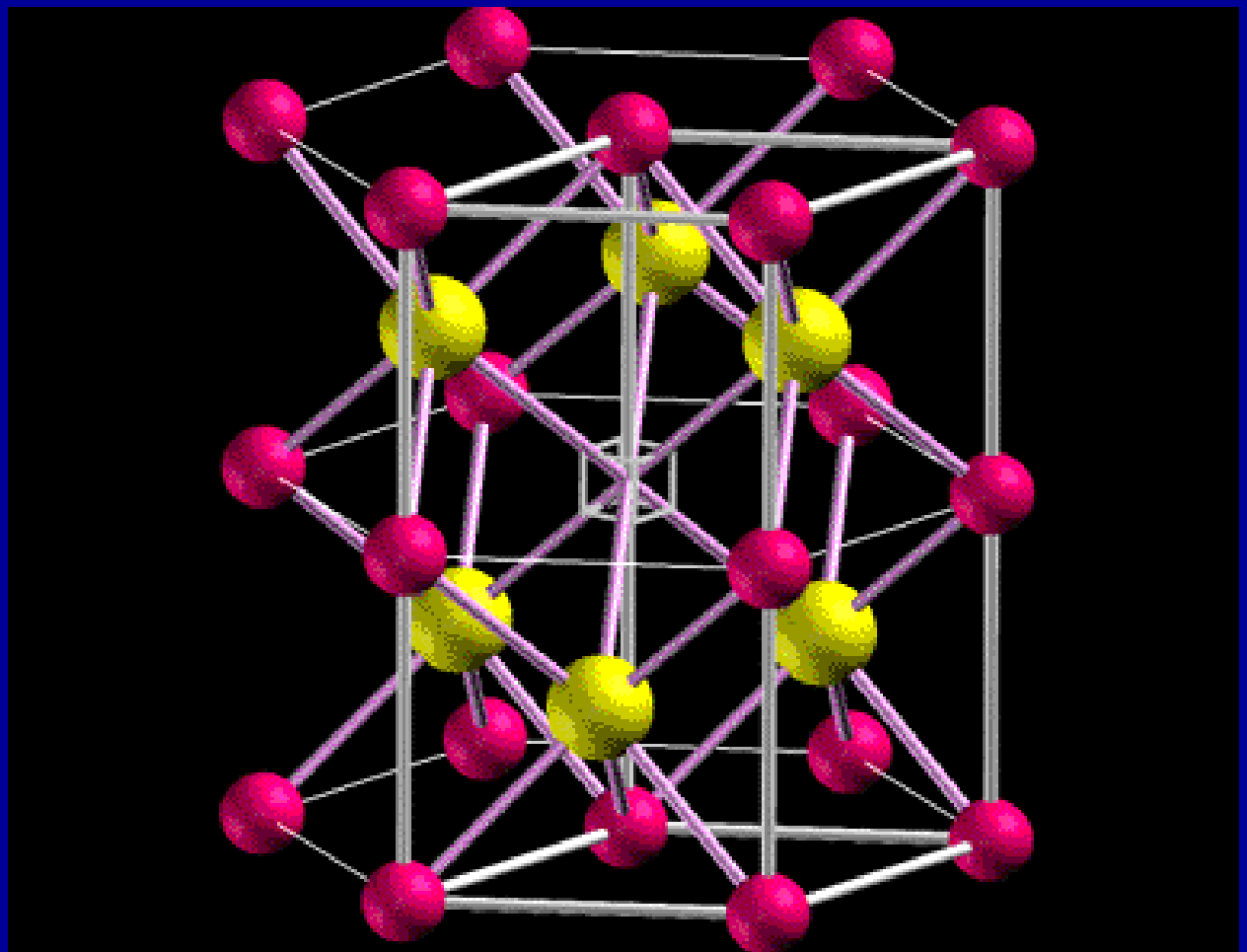


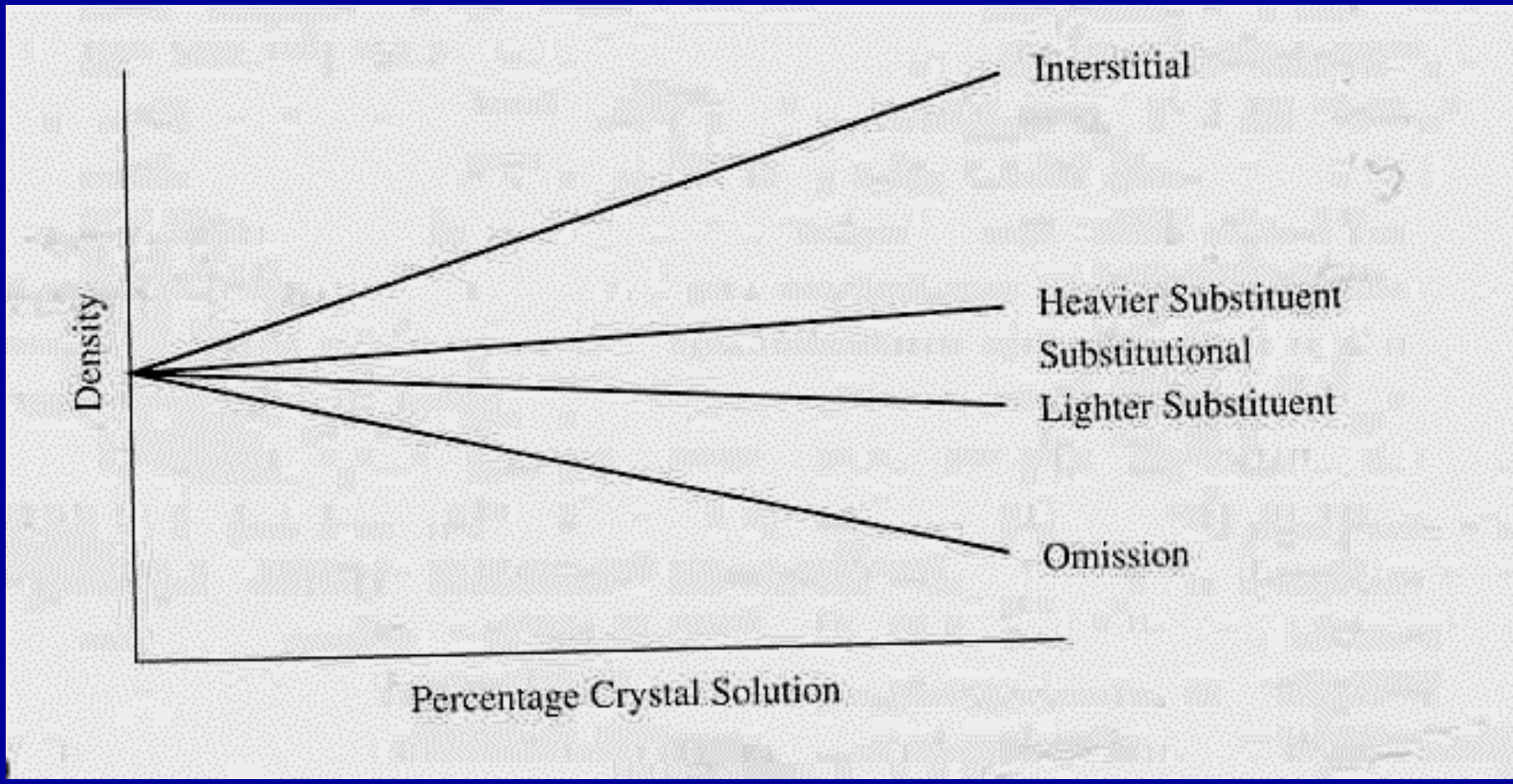

Beryl,
Na(Be2,Li)Al2 Si6O18
Na+ =
Si 4+
Al 3+
(Be2,Li) =

3. Terkedilme (boş bırakma) sonucu olan katı çözeltiler (omission)

$$Fe^{2+} + Fe^{2+} + Fe^{2+} \leftrightharpoons Fe^{3+} + Fe^{3+} + \square.$$

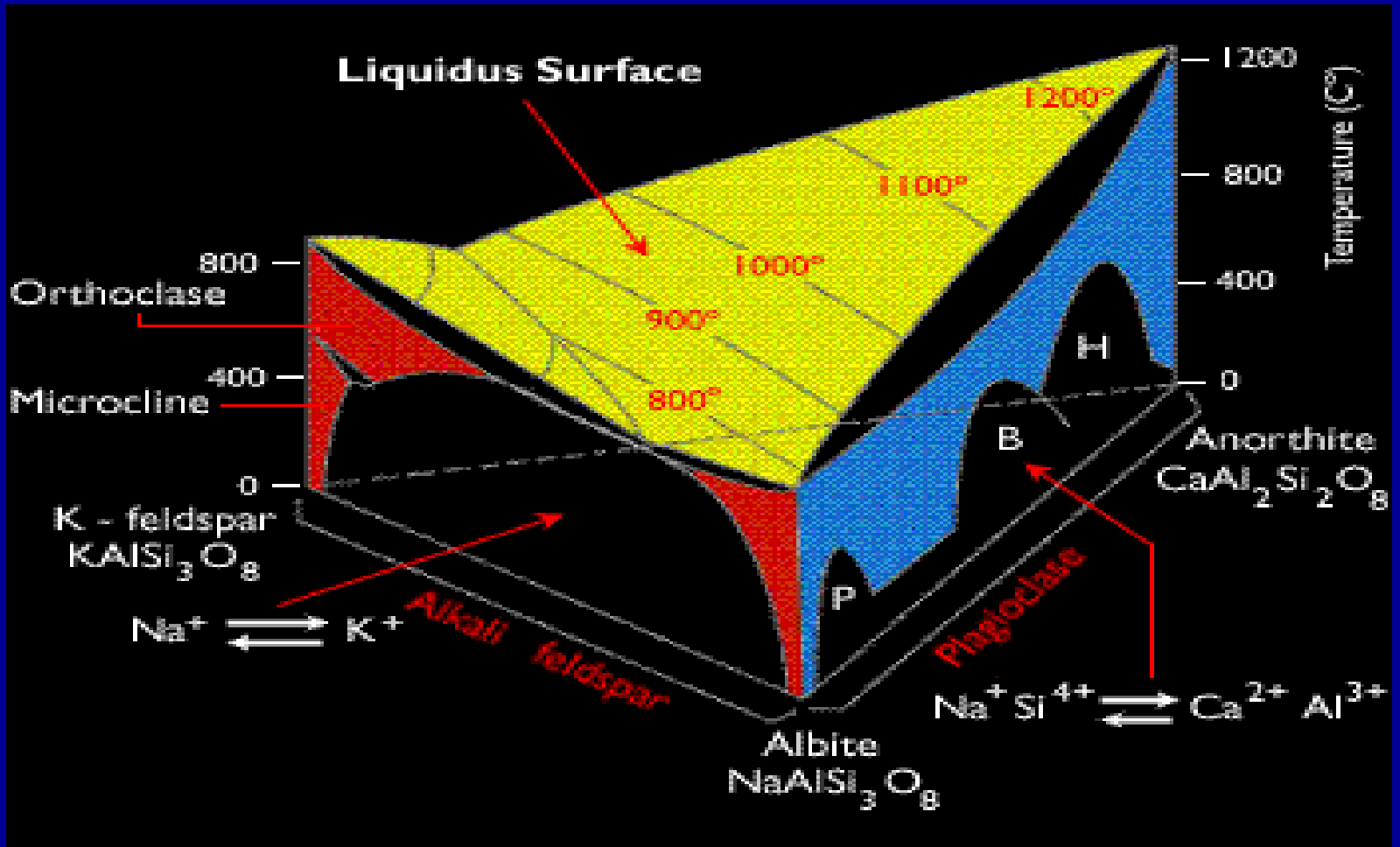
$$(Fe^{2+}_{1-3x} Fe^{3+}_{2x}) \square_x S$$

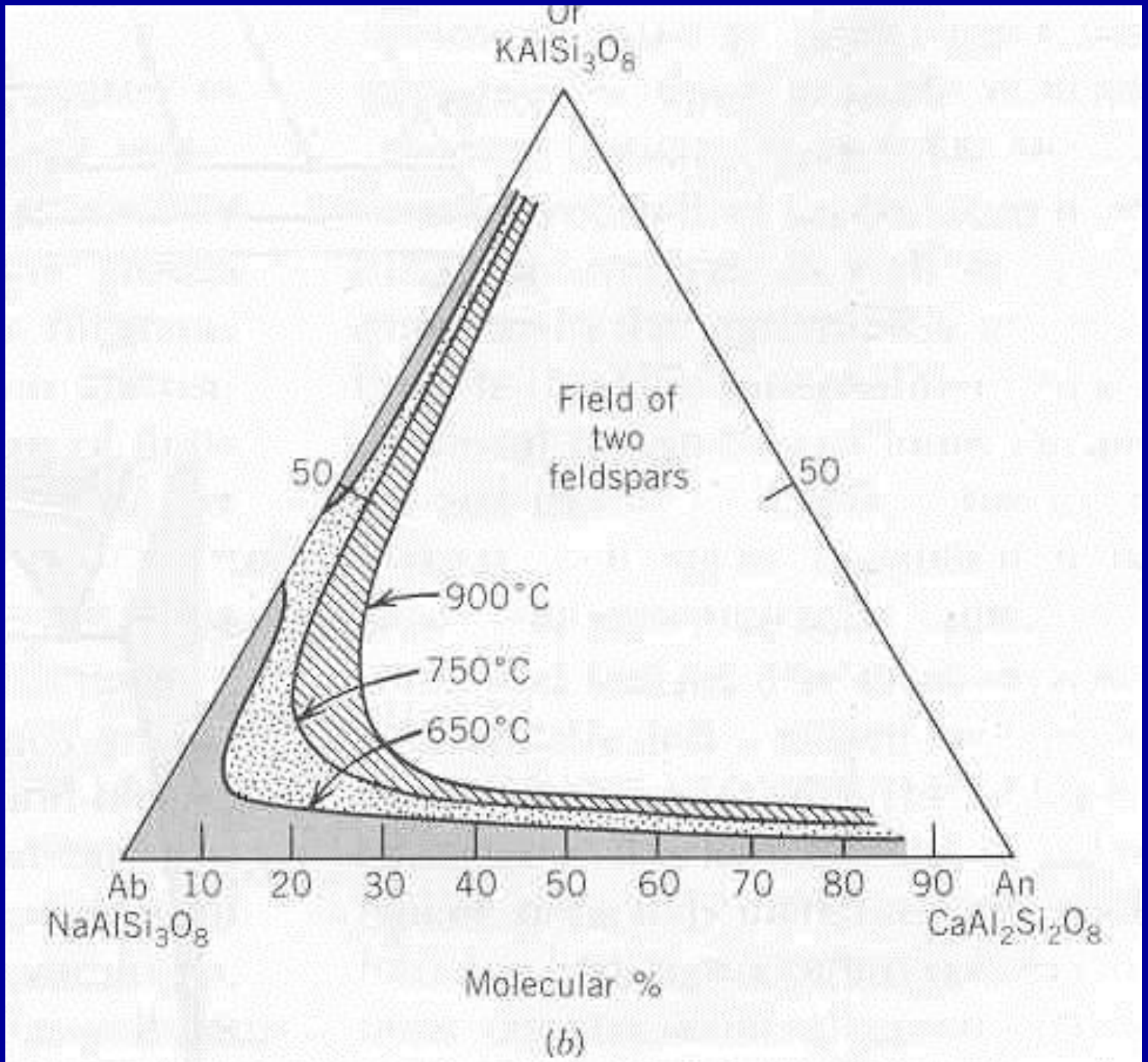



Interstitial
Heavier Substituent
Substitutional
Lighter Substituent
Omission
Density
Percentage Crystal Solution

Ornatma sırasındaki sıcaklığın etkisi:

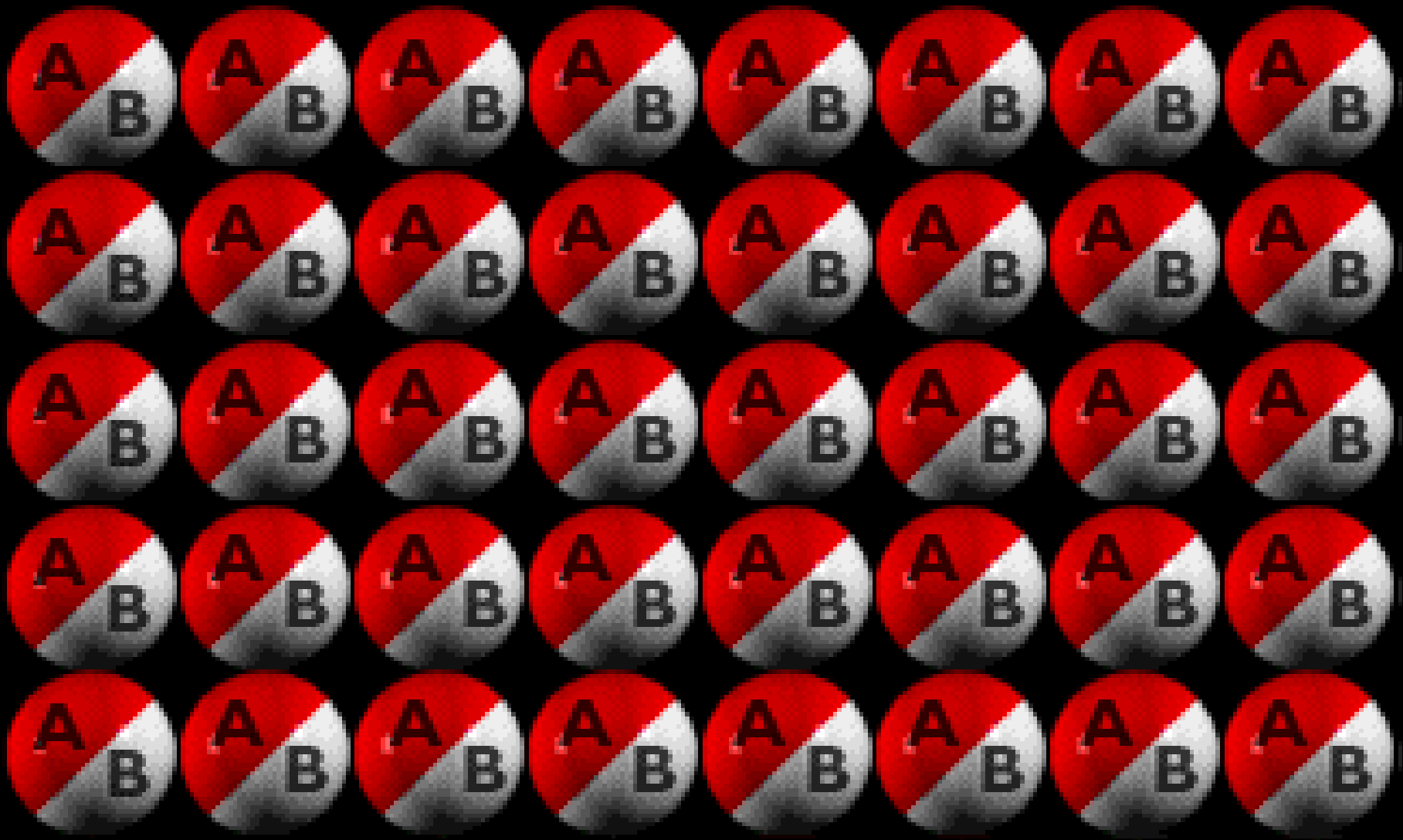
Genellikle yüksek ısılarda ornatma daha kolay ve büyük oranda gerçekleşir. Özellikle ornatan ve ornatılan atom veya iyonların boyutları çok farklı olduğunda bu daha belirgin olur.



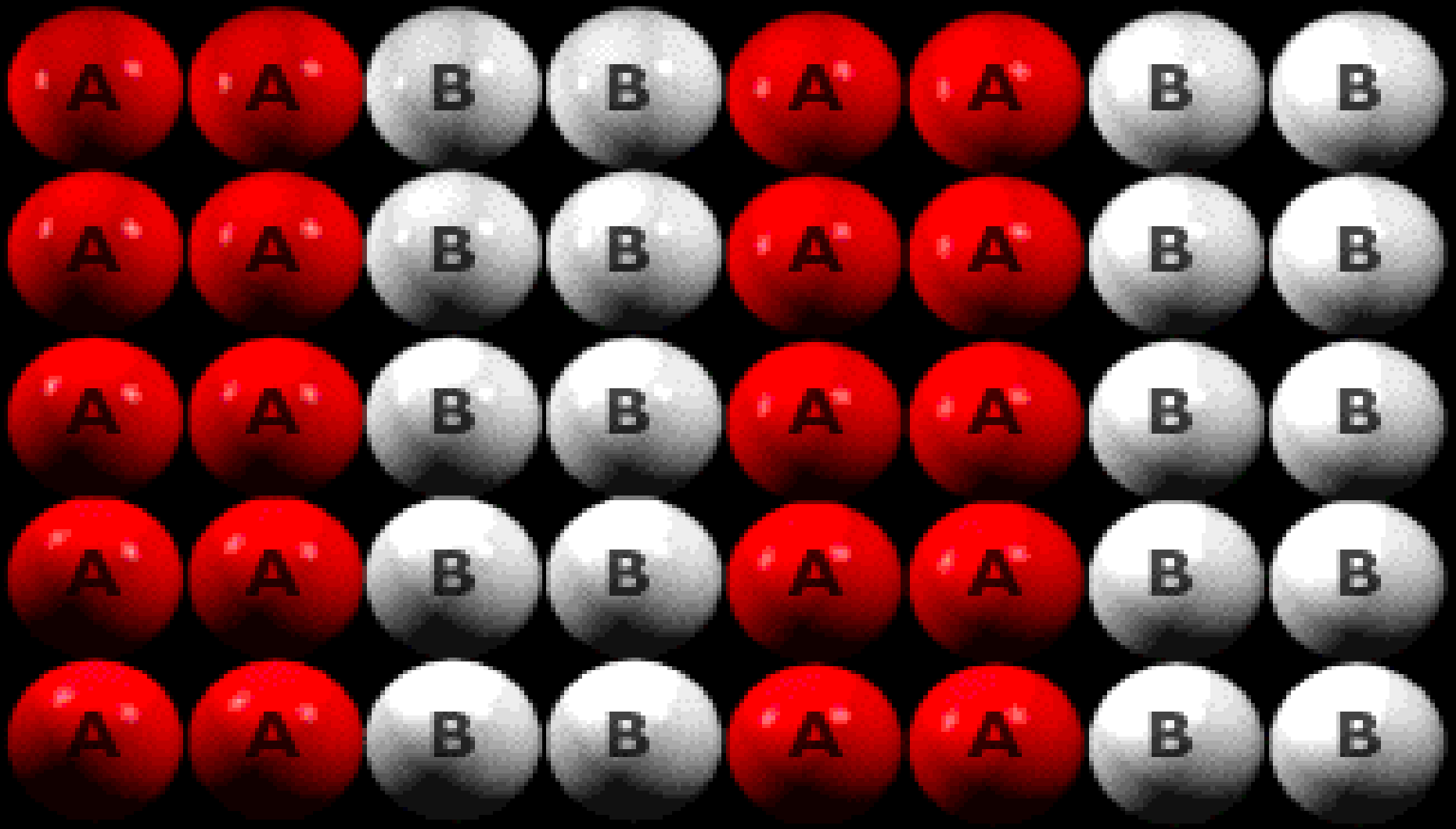

Or
$KAlSi_3O_8$
Field of
two
feldspars
50
50
900°C
750°C
650°C
Ab
$NaAlSi_3O_8$
10
20
30
40
50
60
70
80
90
An
$CaAl_2Si_2O_8$
Molecular %

(*b*)

High temperature



Low temperature Düşük Sıcaklık Eksolusyon lamelleri



Yapısal Hatalar:

I. Noktasal (a. Atomlar arası boşluğa yerleşme,

b.Schottky, c.Frenkel)

II. Çizgisel (a.Kenar dislokasyonu,

b. Vida dislokasyonu)

III.Düzlemsel (a. Dizinim(paketlenme stacking),

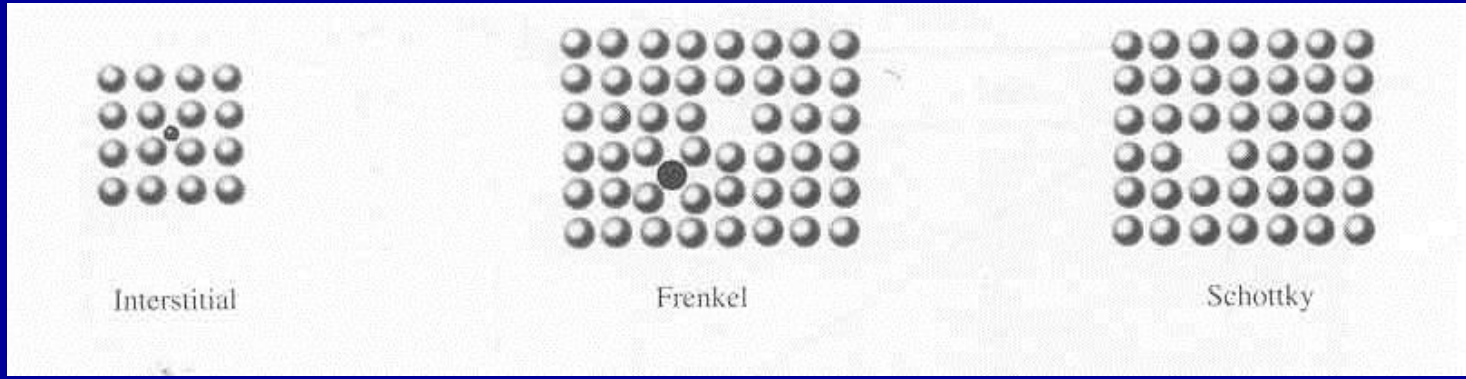
b.tane sınırı, c. dalcıklı (lineage))

IV. Hacimsel (Düzensizlik)

V. Özel Hatalar (İkizlenmeler)

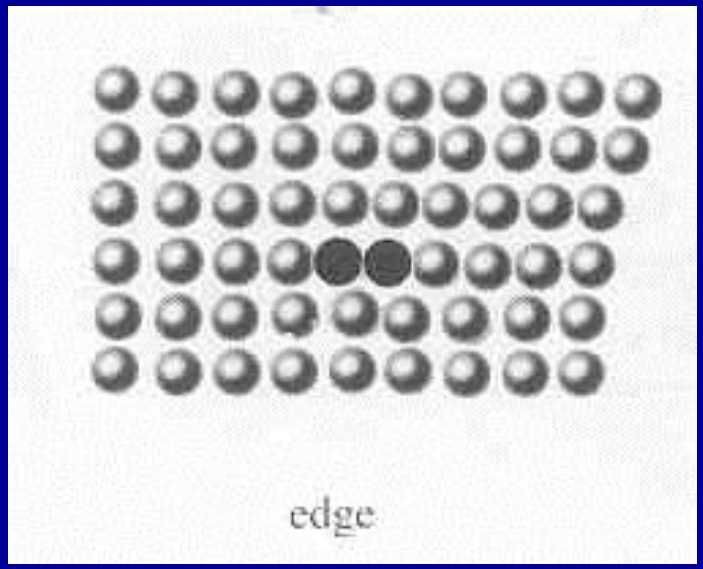
Yapısal Hatalar

I Noktasal Hatalar

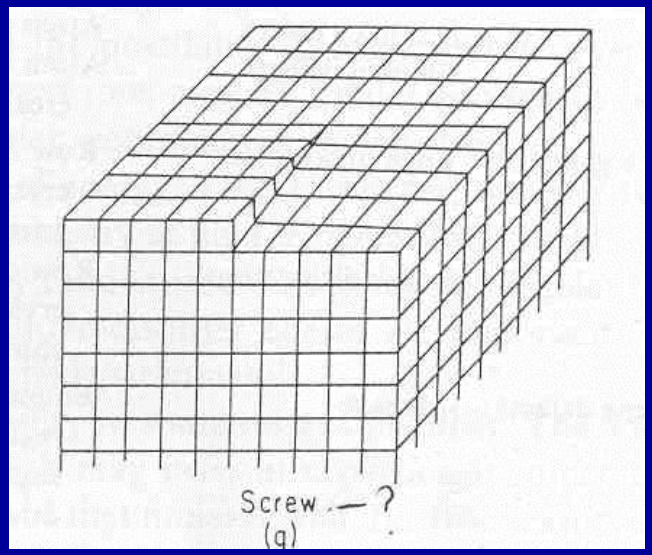


Atomlar arası Frenkel Schottky

II Çizgisel Hatalar

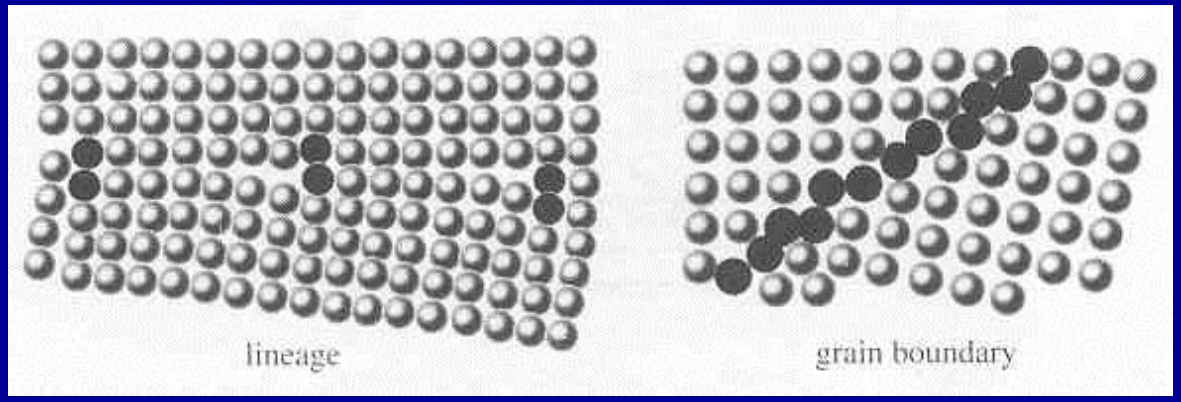


Kenar Dislakasyonu



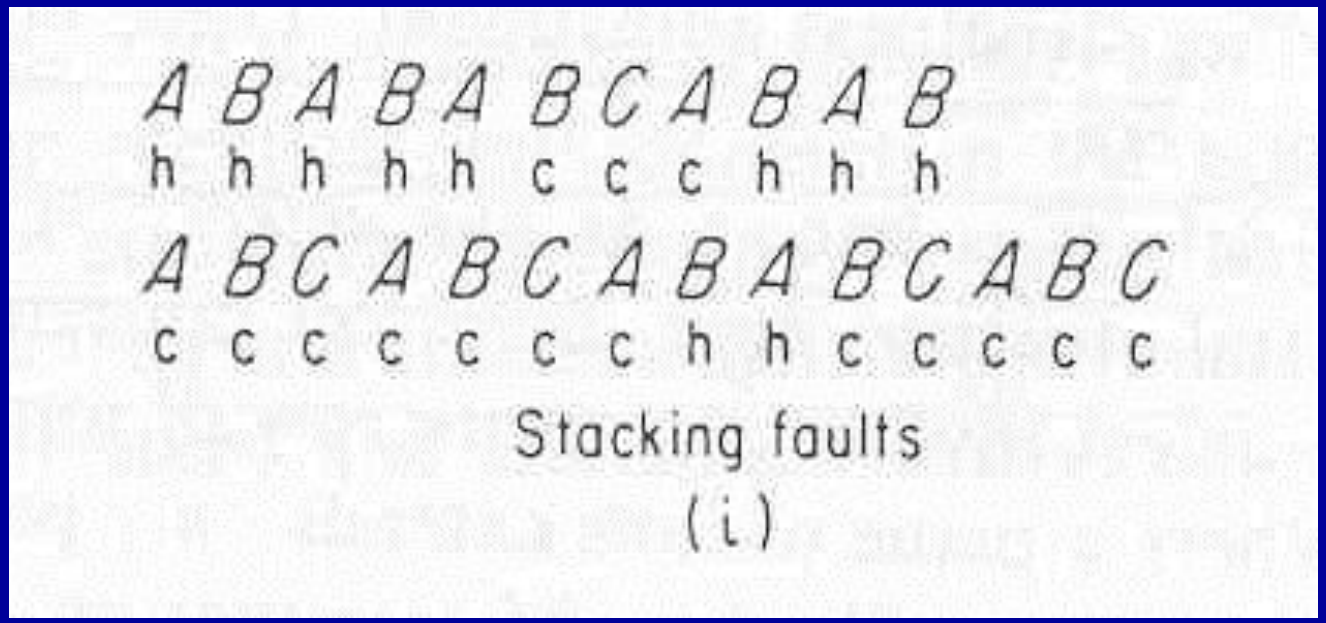
Vida Dislakasyonu

III Düzlemsel Hatalar



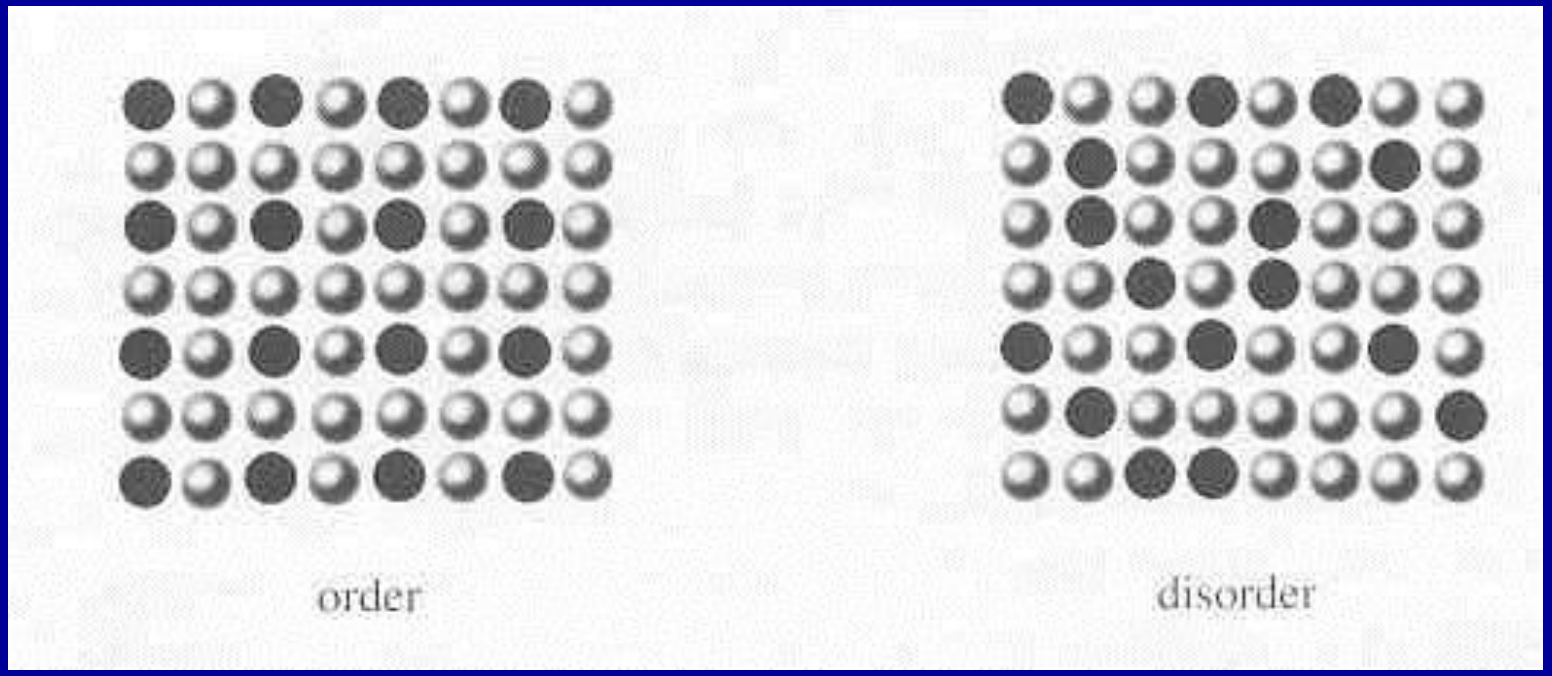
Dalcıklı yapı

Tane sınırı



Dizinim hataları

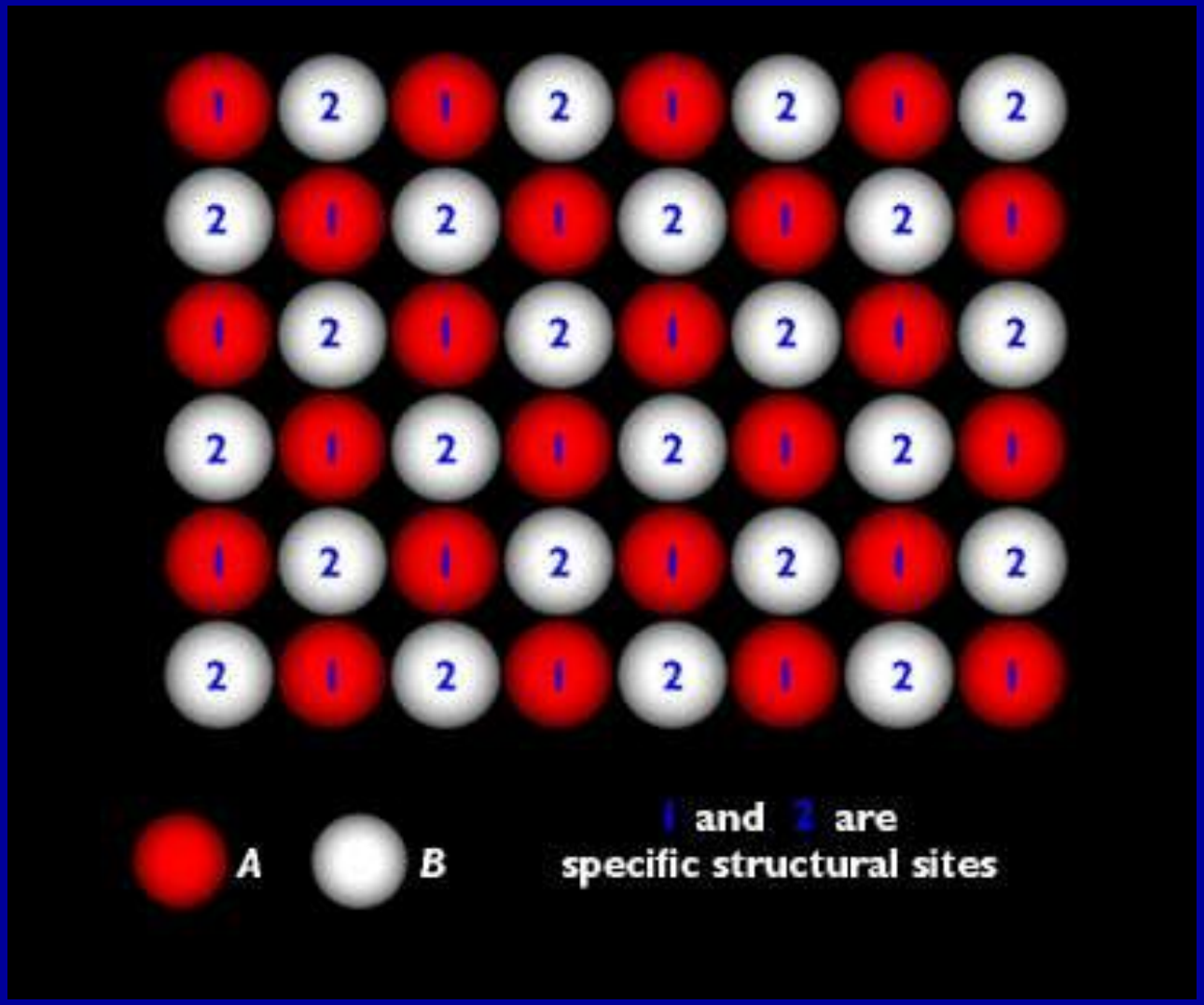
IV Hacimsal hatalar



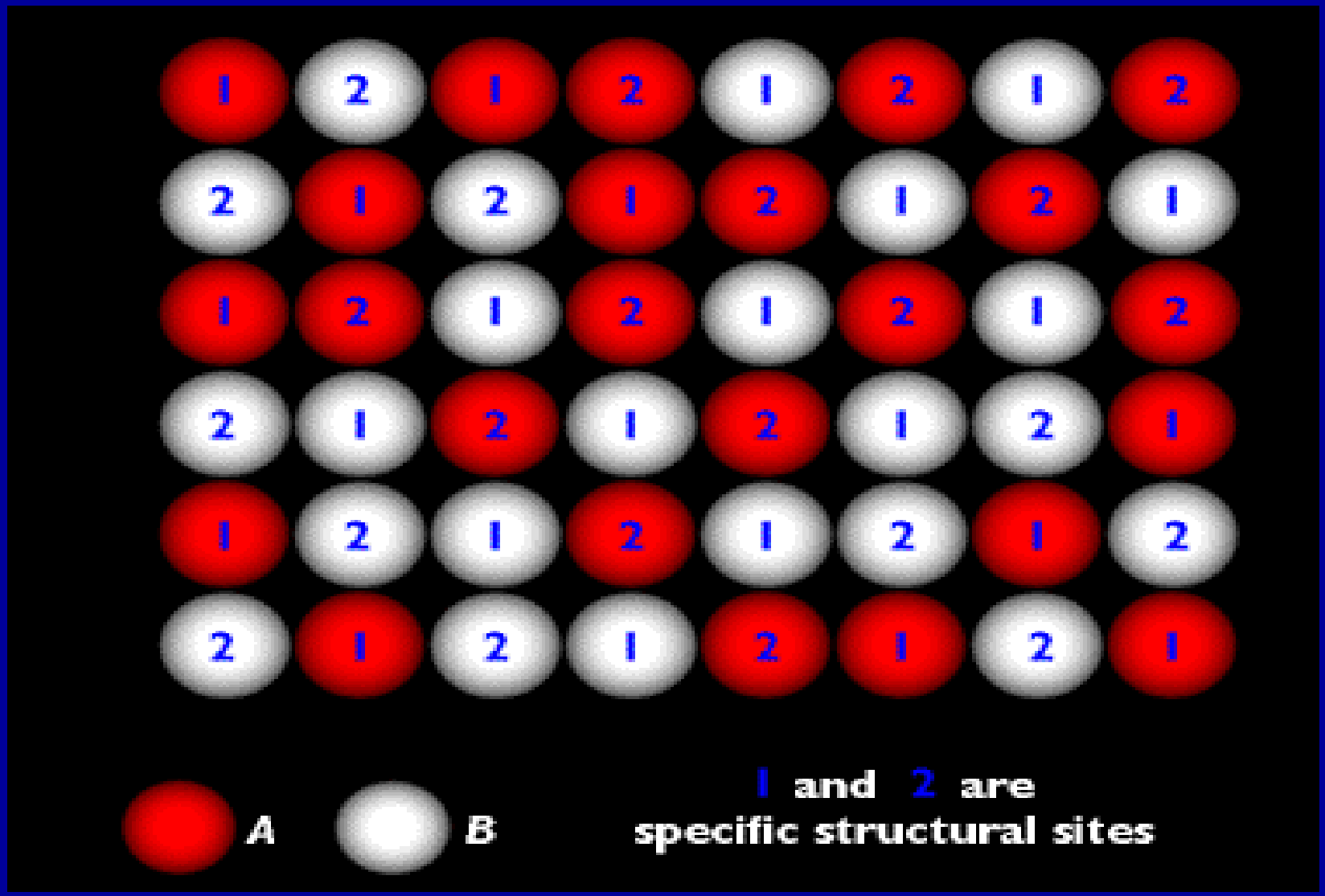
Düzen

Düzensizlik

Düzenli yapı



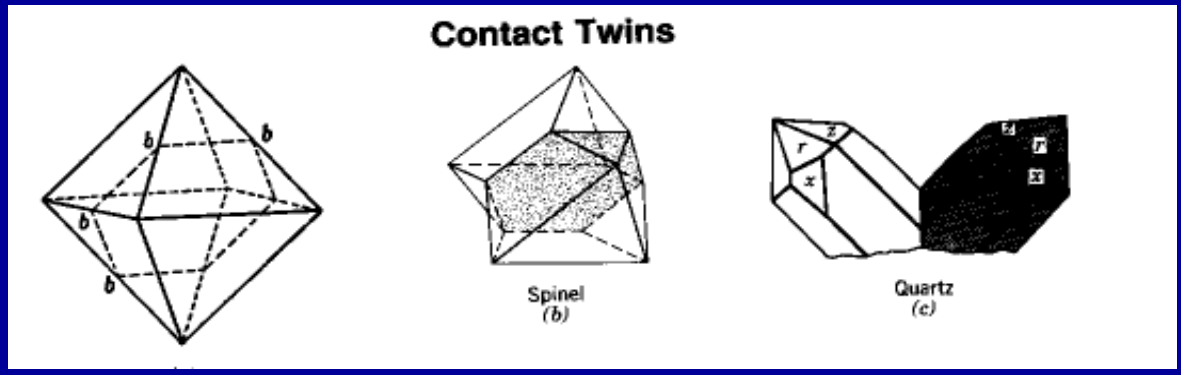
Yapılarda düzensizlik

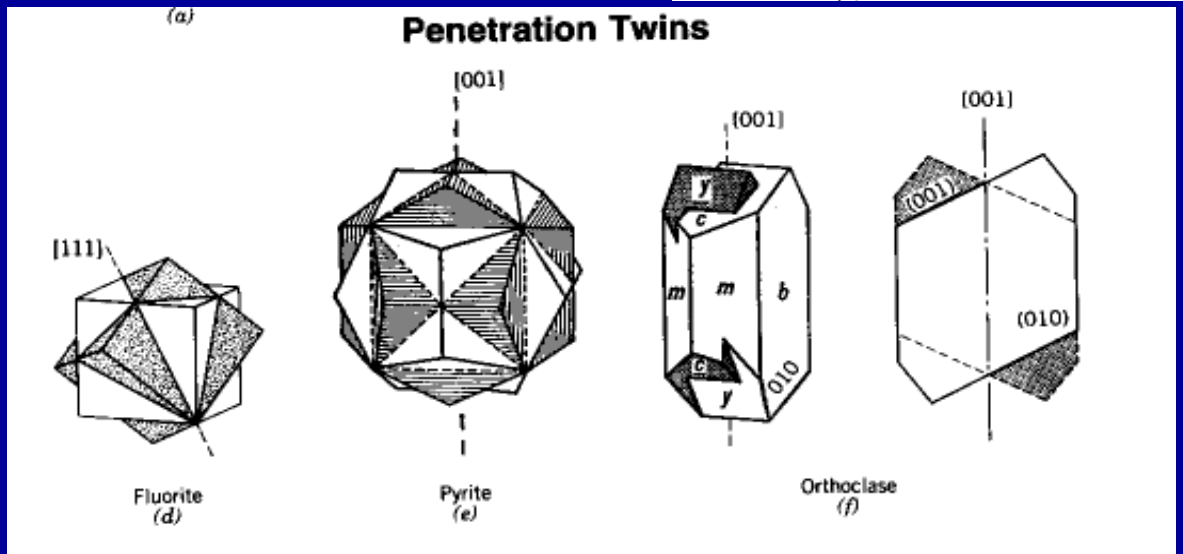


Özel Hatalar: İkizlenmeler

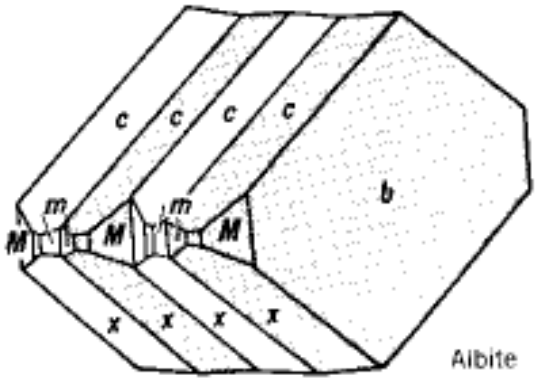
Ayni maddeden iki veya daha fazla sayıdaki kristalin simetrik iç büyümesidir.İkiz veya çokuz daki bireyler bir simetri elementine göre iç büyüme gösterirler. Bu simetri elementleri (simetri ekseni, simetri düzlemi) ikizsiz kristallerde bulunmaz.

Şekillerine göre:



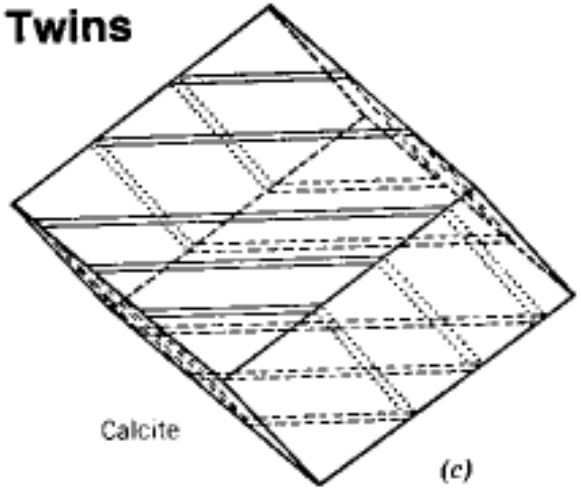


Polysynthetic Twins



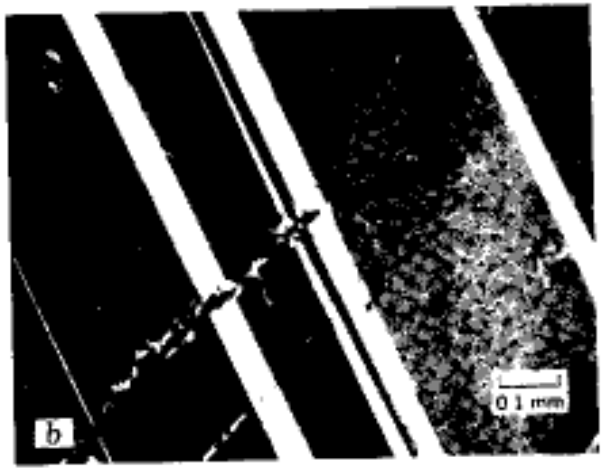
Albite

(a)

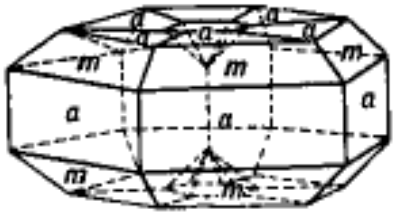


Calcite

(c)

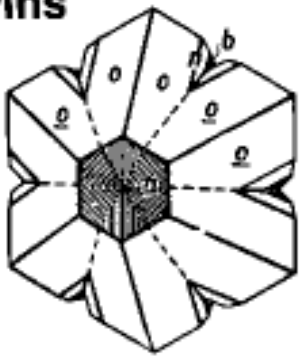


Cyclic Twins



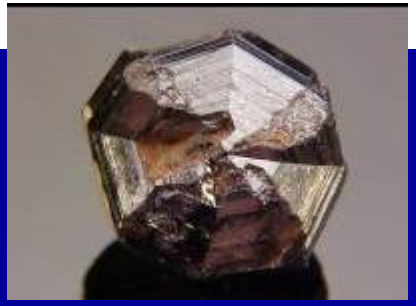
Rutile

(d)

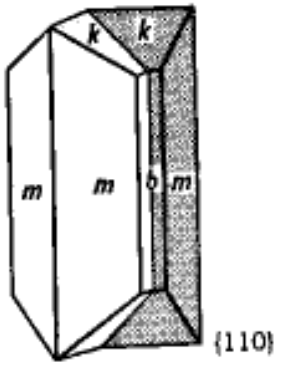


Chrysoberyl

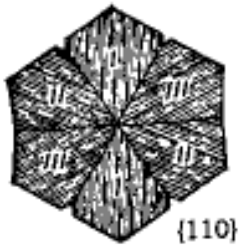
(e)



Orthorhombic Twins

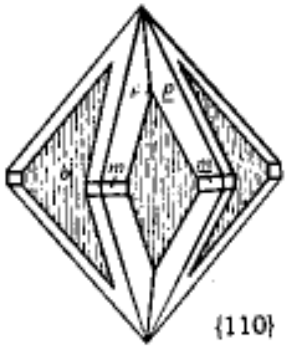


{110}



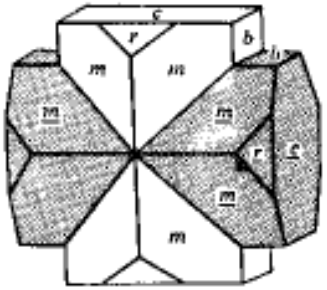
{110}

Aragonite
(a)

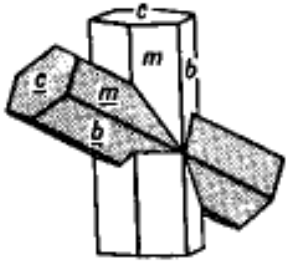


{110}

Cerussite
(b)



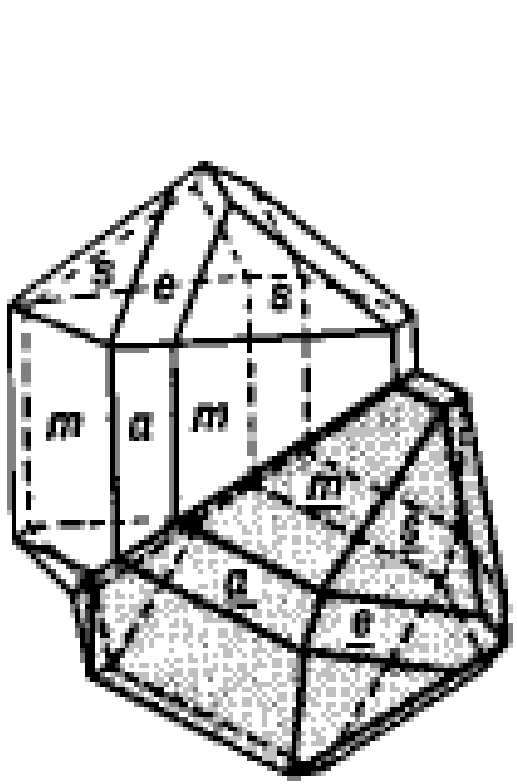
{031}



{231}

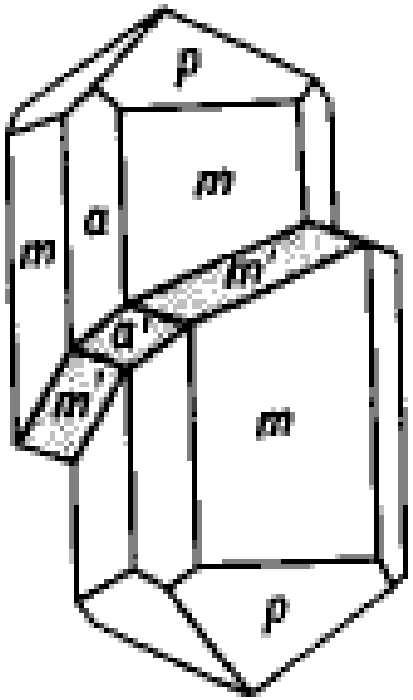
Staurolite
(pseudo-orthorhombic)
(c)

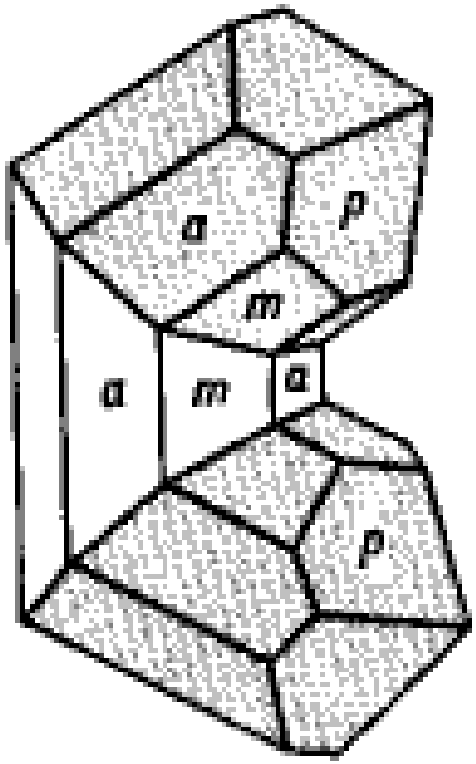
Tetragonal Twins



{011}

Cassiterite



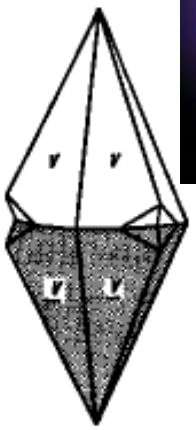


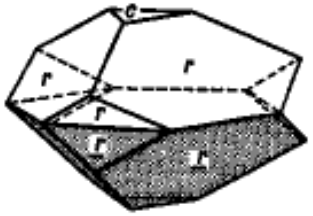
{011}

Rutile

Hexagonal Twins

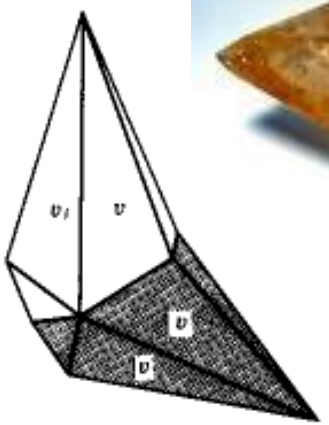
Calcite



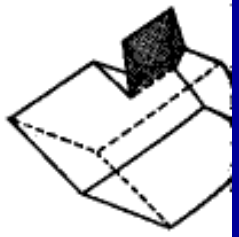


{0001}

(a)



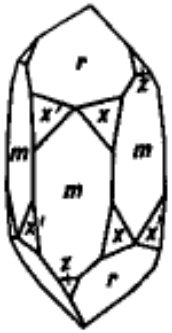
{01$\bar{1}$2}



{01$\bar{1}$2}

(b)

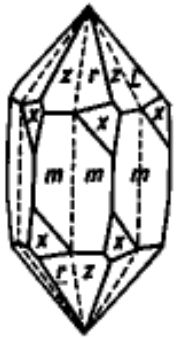
Quartz



{11$\bar{2}$0}

Brazil twin

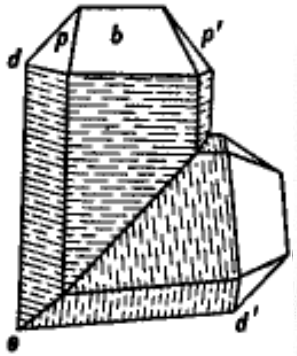
(c)



{0001}

Dauphiné twin

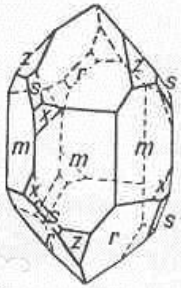
(d)



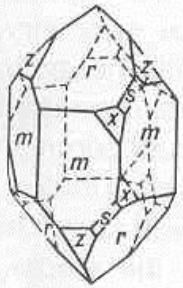
{11$\bar{2}$2}

Japan twin

(e)



Left-handed



Right-handed

(b)

Sol+sağ

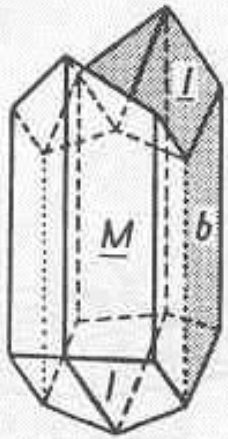
Sağ +Sağ

Brazilya

Dauphine

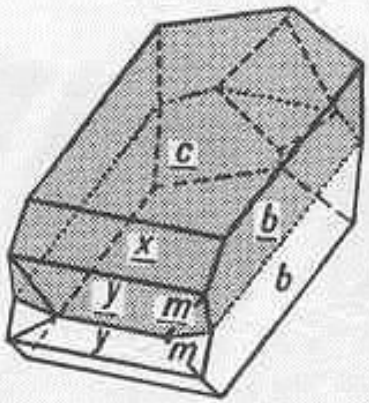
Japon

Monoclinic Twins



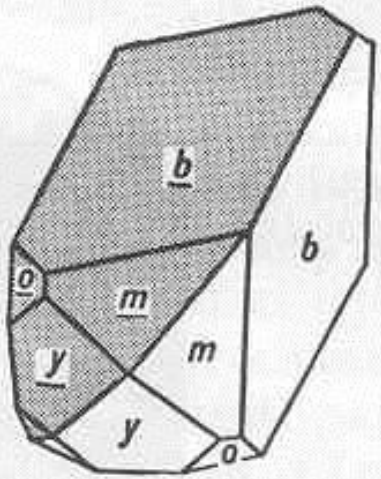
Gypsum.
Twin plane {100}.

Swallow-tail twin



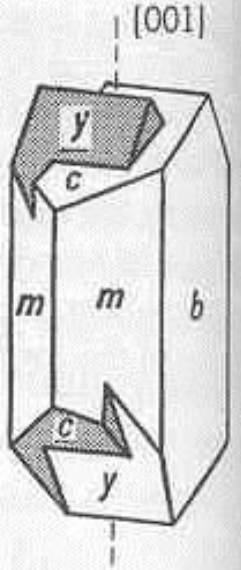
Twin plane {001}.

Manebach twin



Twin plane {021}

Baveno twin



Twin axis [001].

Carlsbad interpenetration twin

Orthoclase

MİNERALLERDE BİLEŞİMSEL DEĞİŞİKLİKLER NEDEN KAYNAKLANIR?

Katı çözelti mekanizmaları?

Katı çözelti oluşturmada etkiyen faktörler?

Yapısal Hata nedir ve oluşum mekanizmaları?