

**Polymorphs---many forms**

- (1) same composition;**
- (2) different crystal structure**

**Examples:**

**C --- graphite, diamond**

**FeS<sub>2</sub> --- pyrite, marcasite**

**CaCO<sub>3</sub> --- calcite, aragonite**

**Al<sub>2</sub>SiO<sub>5</sub> --- kyanite, andalusite, sillimanite**

**TiO<sub>2</sub> --- rutile, anatase, brookite**

**SiO<sub>2</sub> --- low quartz, high quartz, low tridymite,  
high tridymite, low cristobalite, high  
cristobalite, coesite, stishovite, kaetite**

**Isomorphs---same forms  
(solid solution series)**

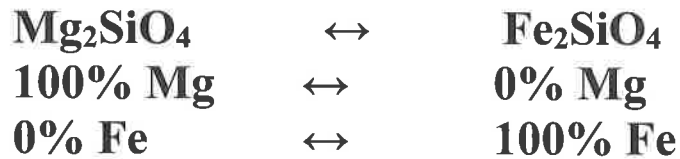
- (1) different composition;**
- (2) same crystal structure**

**Controlling factors:**

- (1) size**
- (2) charge**
- (3) temperature of formation**

**Examples:**

**Olivine series ---  $(\text{Mg, Fe})_2\text{SiO}_4$   
(simple substitution-one for one)**



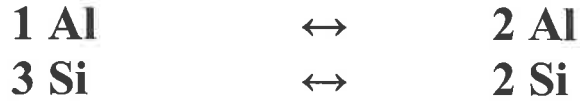
**More than 50% Mg--forsterite**  
**More than 50% Fe--fayalite**

**Plagioclase series--**

**(coupled substitution-two for two)**



**Also**



<b>100%-90% Na</b>	<b>0%-10% Ca</b>	<b>albite</b>
<b>90%-70% Na</b>	<b>10%-30% Ca</b>	<b>oligoclase</b>
<b>70%-50% Na</b>	<b>30%-50% Ca</b>	<b>andesine</b>
<b>50%-30% Na</b>	<b>50%-70% Ca</b>	<b>labradorite</b>
<b>30%-10% Na</b>	<b>70%-90% Ca</b>	<b>bytownite</b>
<b>10%-0% Na</b>	<b>90%-100% Ca</b>	<b>anorthite</b>