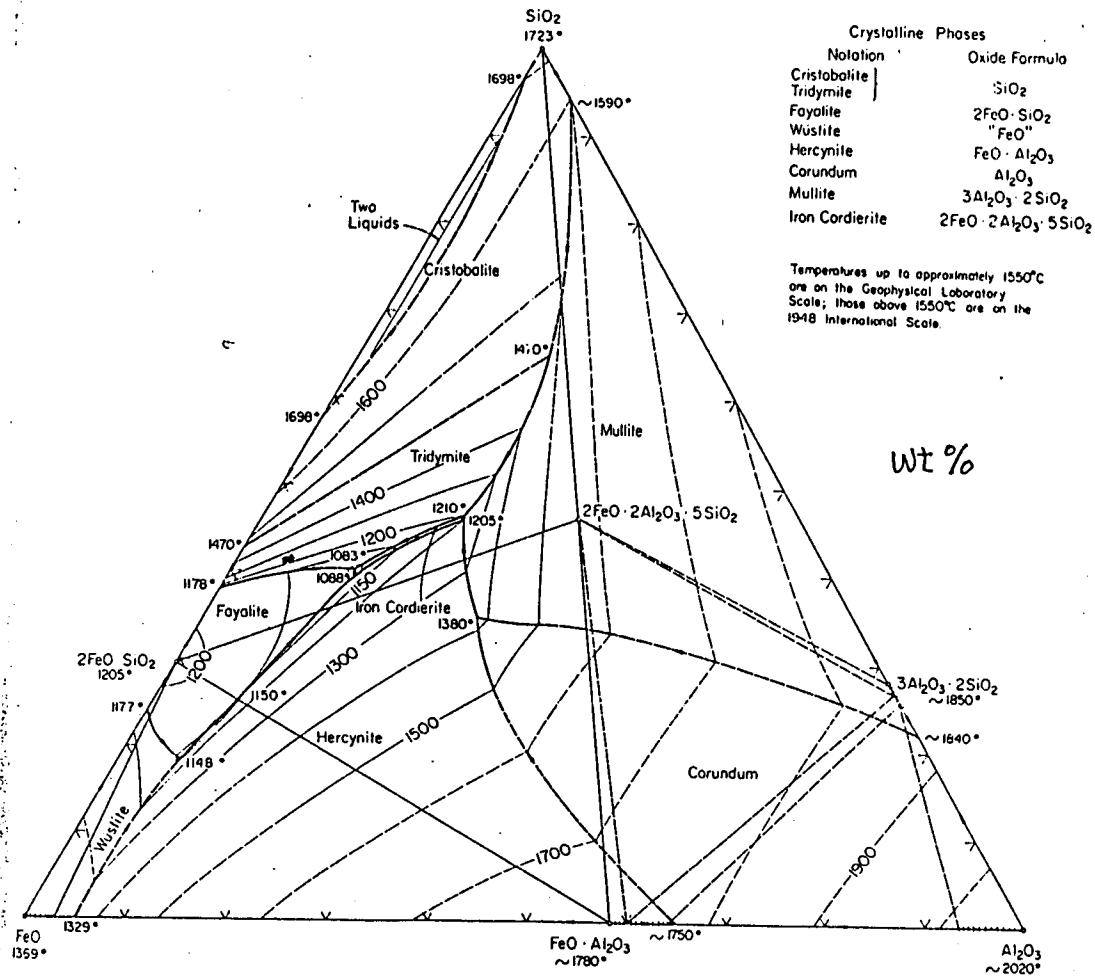


FeO-Al₂O₃-SiO₂



40%

- I. The above phase diagram shows the phase relations of the system FeO-Al₂O₃-SiO₂ at atmospheric pressure. Study this diagram carefully and answer the following questions:
- 1) What temperature is the upper limit of stability of iron cordierite? To what phases does iron cordierite decompose above this temperature?
 - 2) Consider a very homogeneous and very fine-grained mixture of 0.7 grams of fayalite and 0.3 grams of corundum. If it is heated at atmospheric pressure very slowly, so that equilibrium is always maintained during the course of heating. Assume that the partial pressure

III. 簡答, (20%)

1. 試解釋糖果之共鏡處較平緩處易溶於水之原因。
2. 欲將冰箱作冷氣機未使用, 你打算如何作以達到目的?
3. 在相變化 (phase transition) 時, 例如固體之熔解, 係可逆的 (reversible) 故 $\Delta S = 0$, 但亦常見有敘述 (statement) 謂熔解會使熵 (entropy) 增加此 = 敘述是否有矛盾, 如何解釋。
4. 溫度及壓力對 Gibbs free energy, G 之影響為何? 試以水為例, 畫出其 G vs T 圖, 說明當壓力上升時, b.p. 會上升, m.p. 會下降。

IV. Use the Langmuir method to derive expressions for the fractions θ_A and θ_B of a surface covered by adsorbed molecules A and B, assuming the molecules compete for the same sites. (10%)

V. One mole of ammonia (considered to be a perfect gas) initially at 25°C and 1 bar pressure is heated at constant pressure until the volume has trebled. Calculate (a) q , (b) w , (c) ΔH , (d) ΔU , and (e) ΔS . Given: $C_p = 25.895 + 32.999 \times 10^{-3} T - 30.46 \times 10^{-7} T^2$ in $\text{J K}^{-1} \text{mol}^{-1}$. (10%)

VI. For the reaction $\text{Fe}_2\text{O}_3(\text{cr}) + 3\text{CO}(\text{g}) = 2\text{Fe}(\text{cr}) + 3\text{CO}_2(\text{g})$, the equilibrium constant $K = 0.05$ at 1120°C . At this temperature for the reaction $2\text{CO}_2(\text{g}) = 2\text{CO}(\text{g}) + \text{O}_2(\text{g})$, $K = 1.4 \times 10^{-12}$ bar. What equilibrium partial pressure of O_2 would have to be supplied to a vessel at 1120°C containing solid Fe_2O_3 just to prevent the formation of Fe? (10%)

of oxygen during the course of heating is strictly controlled, so that iron remains in its ferrous (divalent) state during the course of heating. At what temperature does this mixture start to melt? and at what temperature does it melt completely? What phases are present in this mixture at 1000°C, 1200°C, and 1400°C respectively?

- 3) At what temperature does tridymite transform to cristolite?
- 4) There is a primary field of two liquids in this system. What does the term "two liquids" mean?

(10%) II. Construct an isothermal section at 1250°C to show the phase relation of the system diopside-albite-anorthite at 1250°C.

