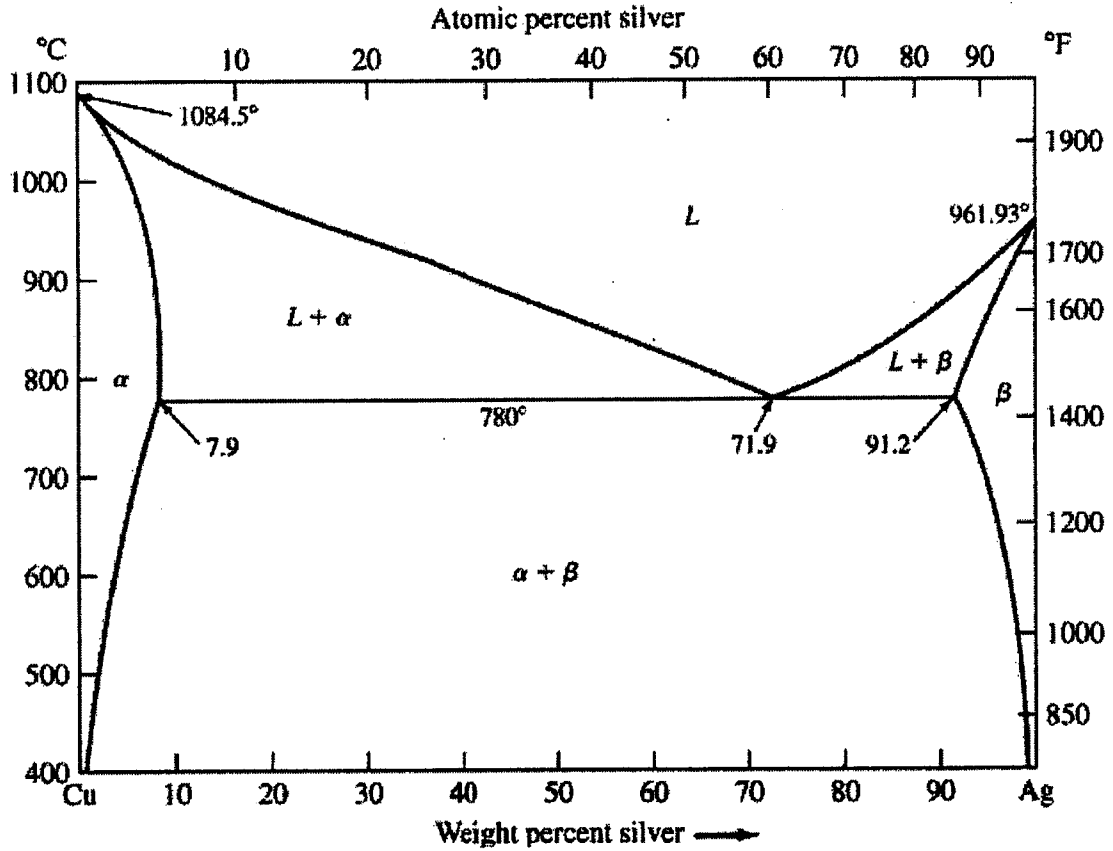


1. (I) Within a cubic unit cell, sketch the following directions:
(a) $[\bar{1}\bar{1}\bar{1}]$ (b) $[101]$ (c) $[211]$ (d) $[3\bar{1}2]$ (12%)
(II) Draw an orthorhombic unit cell, and within that cell a (120) plane. (8%)
2. (I) Draw mer structures for (a) polyethylene (b) poly(vinyl chloride) (c) polytetrafluoroethylene (d) polypropylene and (e) polystyrene. (10%)
(II) Make comparisons of thermoplastic and thermosetting polymers (a) on the basis of mechanical characteristics upon heating, and (b) according to possible molecular structures. (10%)
3. When a cold-work metals is heated into the temperature range where (I) recovery, (II) recrystallization takes place, how are the following affected: (a) internal residual stresses (b) strength (c) ductility, and (d) hardness? (20%)
4. Materials engineers are often called on to design alloys having high strengths yet some ductility and toughness. Describe in your own words the three mechanisms of strengthening in single-phase metals. Be sure to explain how dislocations are involved in each of the strengthening techniques. (20%)
5. For the copper-silver phase diagram, make phase analyses of an 90wt% Ag-10 wt% Cu alloy at the temperatures (a) 950°C , (b) 800°C , (c) $780^{\circ}\text{C} + \Delta T$, (d) $780^{\circ}\text{C} - \Delta T$. In the phase analysis, include:
(i) The phases present
(ii) The chemical compositions of the phases
(iii) The amounts of each phase
(iv) Sketch the microstructure by using 2 cm diameter circular fields. (20%)

(背面仍有題目,請繼續作答)



The copper-silver phase diagram.

(after "Metals Handbook", vol.8, 8th ed., American Society for Metals, 1973, p.253.)