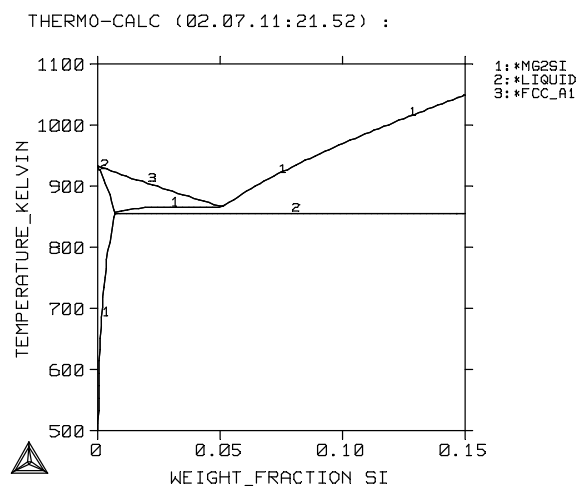


MATE4001: Light Alloys
Tutorial: Topics in Aluminium

1. What are the competitors to aluminium in each of its primary markets and what advantages/disadvantages does aluminium have in each case?
2. It has been suggested that the development of the aluminium can was essential to the subsequent development and growth of the whole aluminium industry. Explain why this might be so.
3. The last major innovation in the aluminium industry was the two piece beverage can, introduced in the 1960's. Why has little of significance happened since then?
4. What are the threats to the aluminium industry?
5. Explain why neither Al-Mg nor Al-Si alloys are precipitation hardenable whereas Al-Mg-Si are.
6. Why are small angle grain boundaries not as effective as interfering with slip as high angle boundaries are?
7. How are clusters, GP zones and precipitates detected? How do we know that they are there and how do we determine when they form, when they disappear and what their structure and composition is?
8. How do Mn and Cr retard and inhibit recrystallization and grain growth in Al alloys? How do these same elements improve toughness, strength and fatigue?
9. Explain why there is an increased interest in the use of trace elements in the design of aluminium alloys.
10. How would you strengthen an Al motor car wheel? Justify your answer.
11. What is "microvoid coalescence" and how does it lead to tensile failure?
12. Why is the concentration of Fe and Si maintained at low levels in aluminium alloys?
13. What is creep and what are the characteristics of a creep resistant material? How can aluminium be made more creep resistant? How would you make an automotive cylinder head creep resistant? Justify your answer.



Pseudo-binary vertical section through the Al-M-Si phase diagram along the Al-Mg₂Si line.