

Phase Diagram Basics

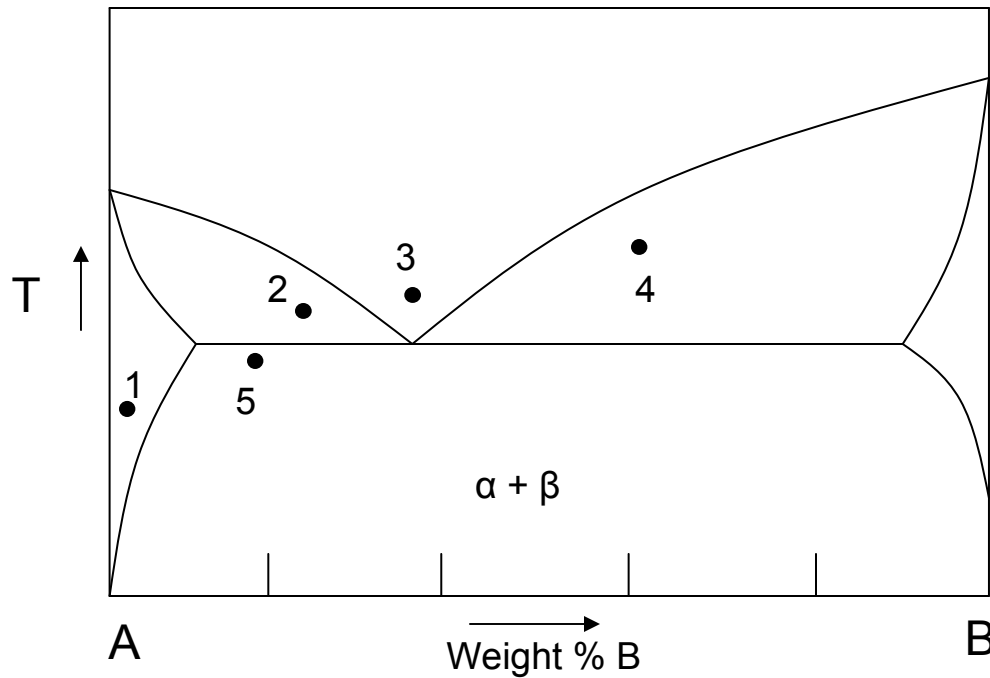
The following pages present a few practice problems, similar to the quiz. These are for your enjoyment only - Not an extra homework assignment.

The first two pages give the questions and are followed by some duplicates for practicing

The remaining pages (blue) are the answers.

Recommendation : DO NOT LOOK at the answers until you have at least tried the problems.

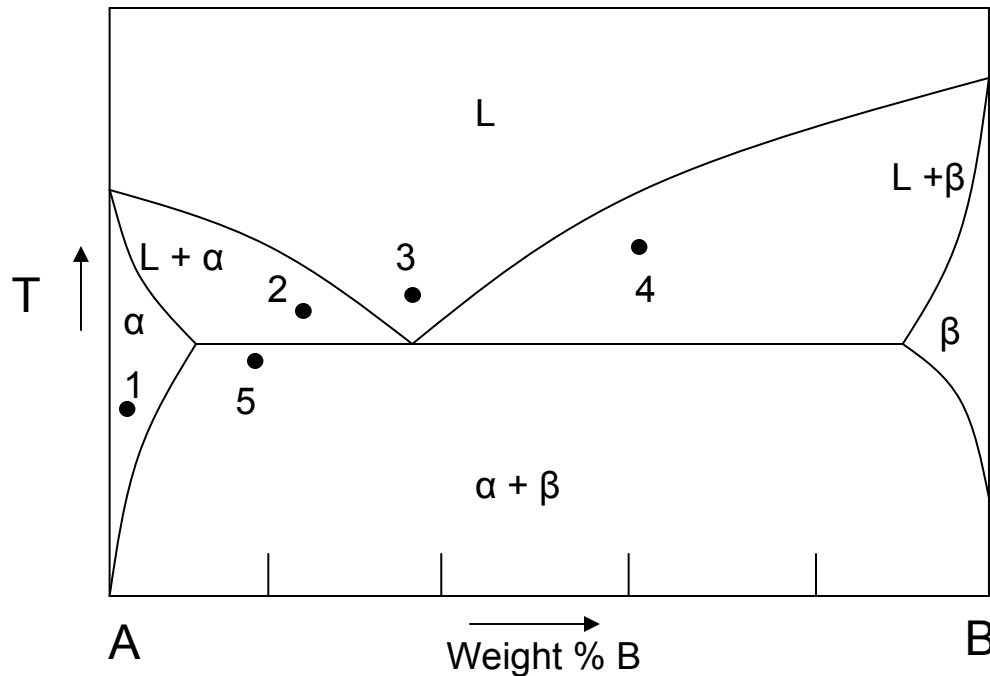
Phase Diagrams (self study/practice)
MAE 2321



Given the above generic eutectic phase diagram for components A and B:

1. Label all areas with the phases present in that area. (5 areas to be labeled)
2. How many different solid phases are found in this diagram?
3. How many micro constituents are possible for solids formed with slow cooling from liquid? (Considering the entire range of compositions)

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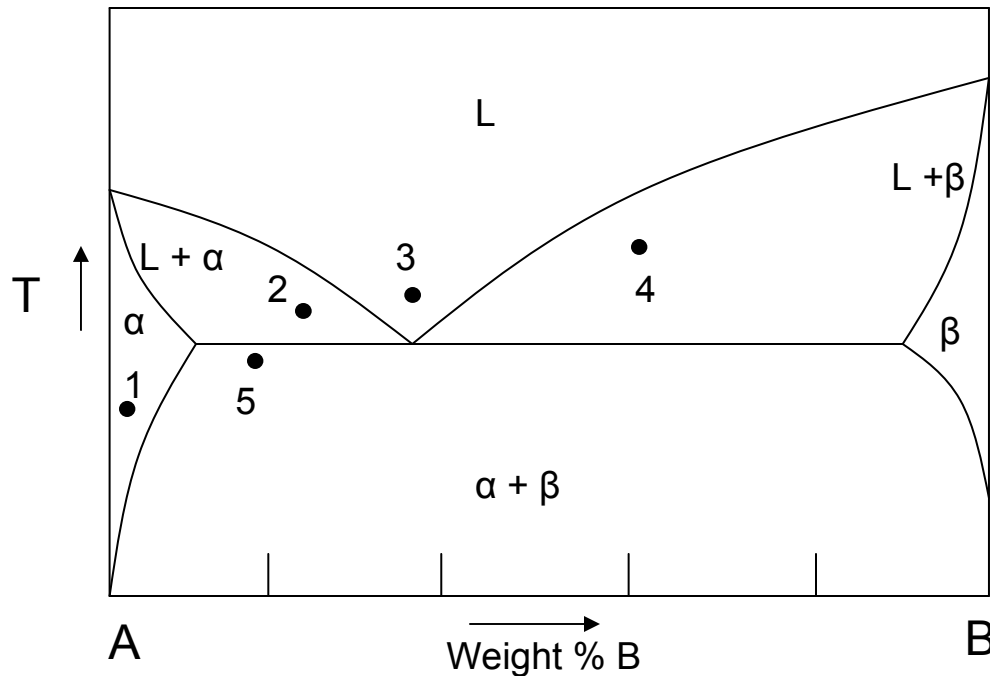


Given the above generic eutectic phase diagram for components A and B:

4. Assuming slow cooling so that equilibrium conditions apply, for each point,

1. Is there liquid present?
2. Is there solid present?
3. What are the phases present?
4. Is there eutectic microstructure present?
5. What are the micro constituents?
6. What is the overall composition?
7. Give the composition of each phase present.
8. Give the mass fraction of each microconstituent.

Phase Diagrams (self study/practice)
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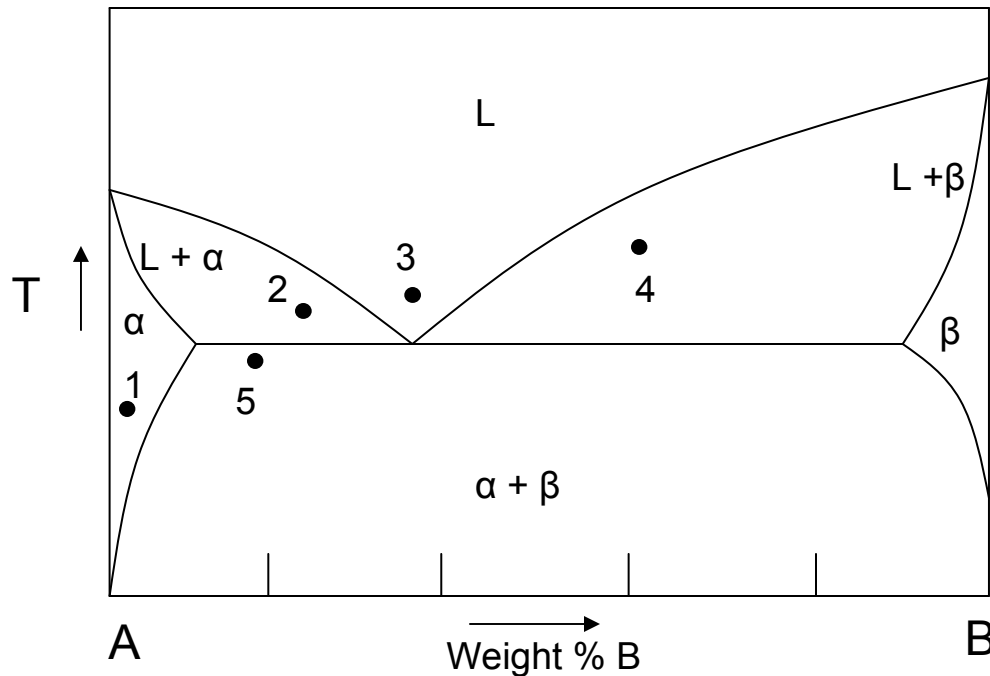


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FUN with Phase Diagrams (self study/practice)
MAE 2321

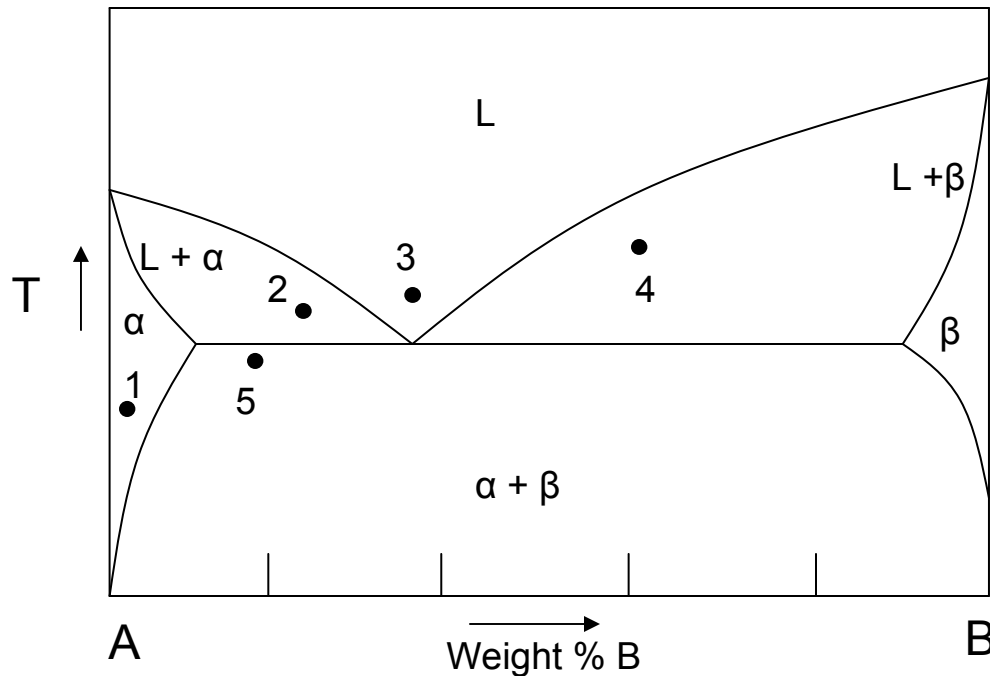


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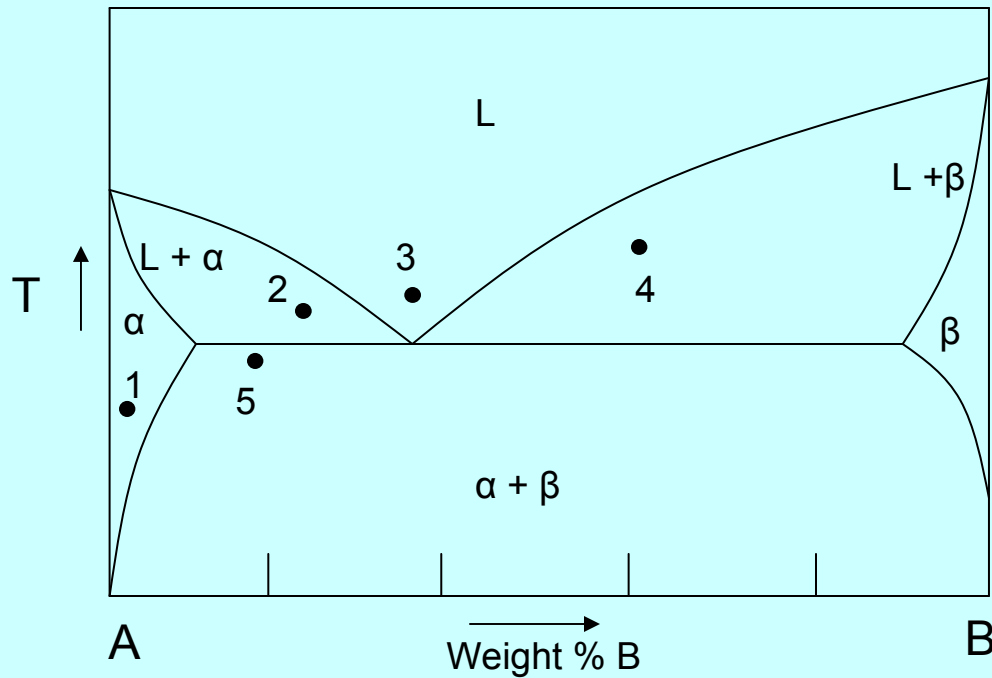


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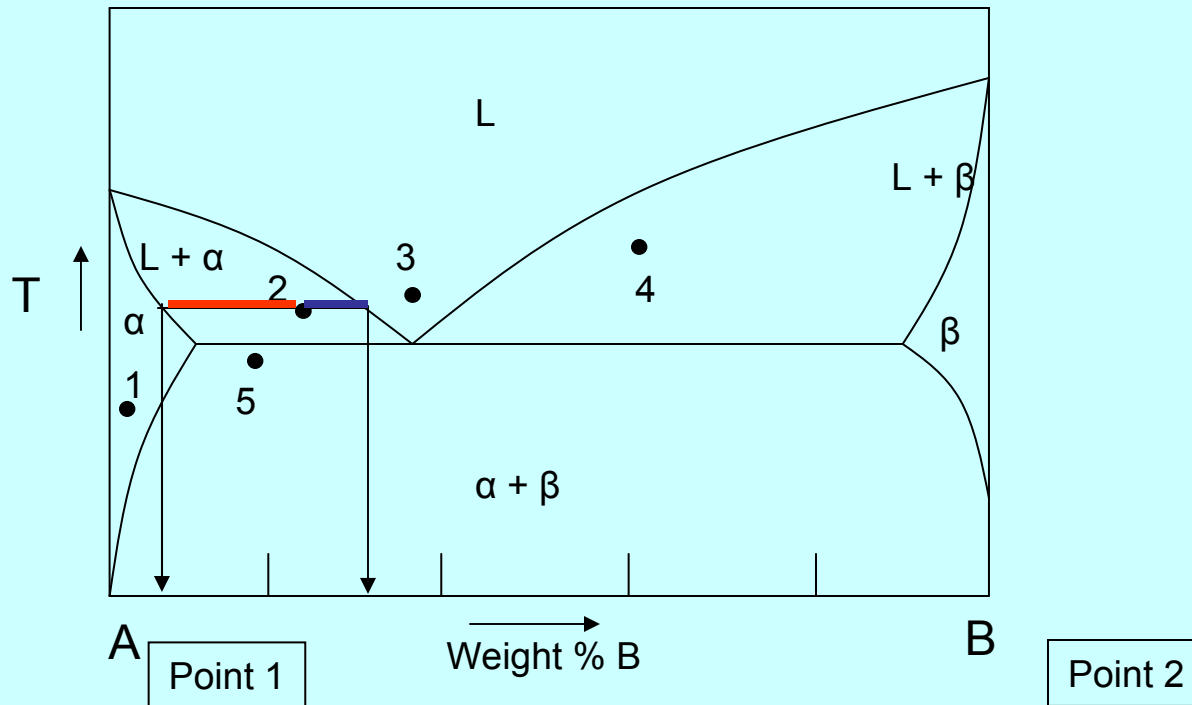
Answers



Given the above generic eutectic phase diagram for components A and B:

1. Label all areas with the phases present in that area. (5 areas to be labeled)
2. How many different solid phases are found in this diagram? **2, α and β**
3. How many micro constituents are possible for solids formed with slow cooling from liquid?
(Considering the entire range of compositions) **3, α , β , and eutectic microstructure**

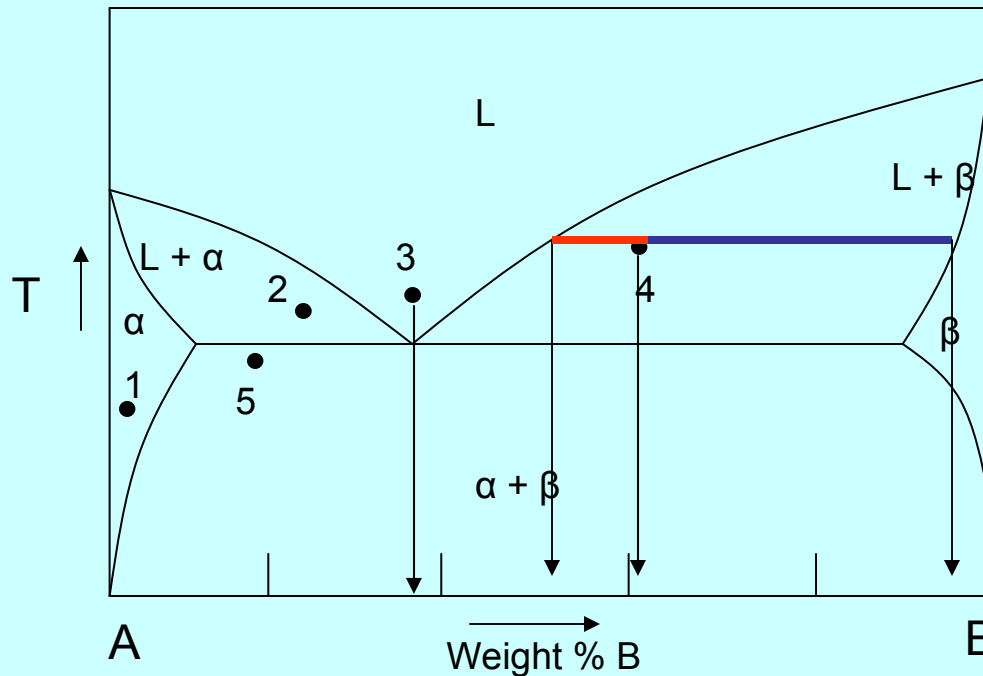
Answers



1. Is there liquid present? No
2. Is there solid present? Yes
3. What are the phases? Alpha
4. Is there eutectic microstructure present? NO
5. What are the micro constituents? Alpha
6. What is the composition 2% B, 98%A
7. Give the composition of each phase present.
 1. Alpha = 2% B, 98%A
8. Give the mass fraction of each microconstituent.
 1. 100% of total weight is Alpha

1. Is there liquid present? Yes
2. Is there solid present? Yes
3. What are the phases? Alpha is solid phase + Liquid
4. Is there eutectic microstructure present? NO
5. What are the micro constituents? Alpha + Liquid
6. What is the overall composition? 25%B, 75%A
7. Give the composition of each phase present.
 1. Alpha = 7% B, 93%A
 2. Liquid = 33%B, 67%A
8. Give the mass fraction of each microconstituent.
 1. Length of Blue/ (length of blue + length of Red) = mass fraction which is alpha $(33-25)/(33-7) = 0.31$
 2. Mass fraction which is liquid is $1 - 0.31 = 0.69$

Answers



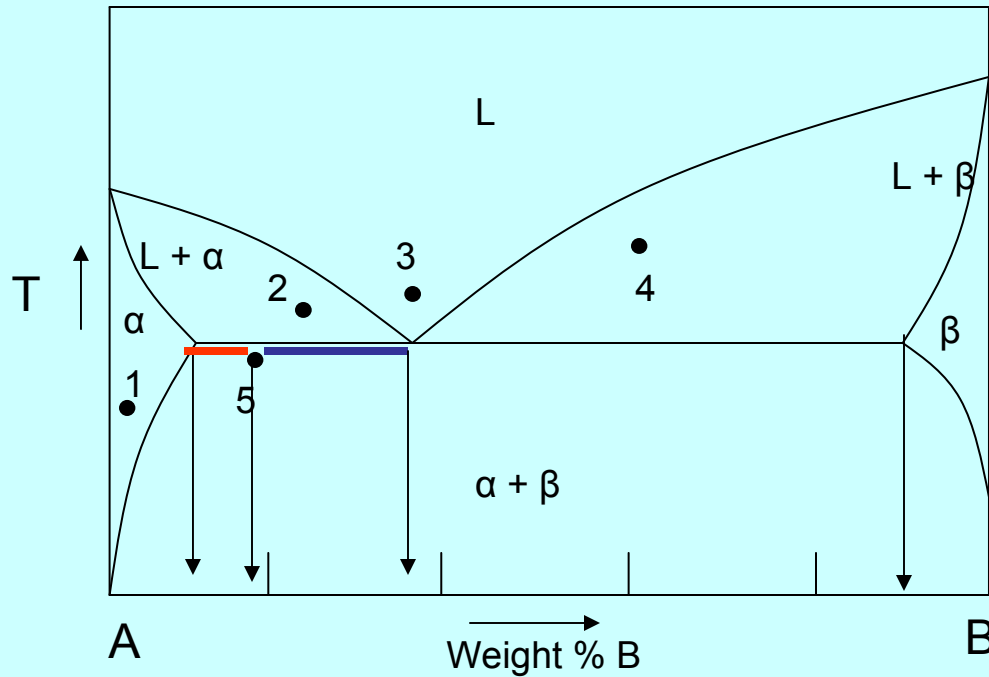
POINT 3

1. Is there liquid present? yes
2. Is there solid present? NO
3. What are the phases? Liquid
4. Is there eutectic microstructure present? NO
5. What are the micro constituents? Liquid
6. What is the composition? 37% B, 63%A
7. Give the composition of each phase present.
 1. Liquid = 37% B, 63%A
8. Give the mass fraction of each microconstituent.
 1. 100% of total weight is liquid

POINT 4

1. Is there liquid present? Yes
2. Is there solid present? Yes
3. What are the phases? Beta is solid phase + Liquid
4. Is there eutectic microstructure present? NO
5. What are the micro constituents? Beta + Liquid
6. What is the overall composition? 62 %B, 38%A
7. Give the composition of each phase present.
 1. Beta = 95% B, 5%A
 2. Liquid = 52%B, 48%A
8. Give the mass fraction of each microconstituent.
 1. Length of Blue/ (length of blue + length of Red) = mass fraction which is liquid $(95-62)/(95-52) = 0.77$
 2. Mass fraction which is beta is $1 - 0.77 = 0.23$

Answers



POINT 5

1. Is there liquid present? NO
2. Is there solid present? Yes
3. What are the phases? Beta and alpha
4. Is there eutectic microstructure present? yes
5. What are the micro constituents? alpha and eutectic microstructure
6. What is the overall composition? 18 %B, 82%A

7. Give the composition of each phase present.
 1. Alpha is 10%B, 90%A
 2. Beta = 90% B, 10%A
8. Give the mass fraction of each microconstituent.
 1. Length of Blue/ (length of blue + length of Red) = mass fraction which is alpha $(37-18)/(37-10) = 0.70$
 2. Mass fraction which is eutectic microstructure is $1 - 0.70 = 0.30$