## Assignment 5

The unit for submitting this assignment has passed. As per our records you have not submitted this assignment.

### Due on 2020-03-04, 23:59 IST.

1. A black steel strip with initial carbon content of 0.2 wt% was quenched in a carbonizing atmosphere at 900°C with constant oxygen concentration of 0.0010 atm. At the time depth of 0.5 mm was achieved in the steel in 4 hours, what is the result of carbon content for removing the case depth? Use the following data for the diffusion of carbon in steel.

<table>
<thead>
<tr>
<th>Depth (mm)</th>
<th>Carbon Content (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0.2</td>
</tr>
<tr>
<td>0.5</td>
<td>0.2</td>
</tr>
</tbody>
</table>

(2 marks)

No. of answers submitted: 0

Answered: 0.2 wt% (Correct)

1 point

2. In Problem 1 above, what would be the case depth if carburizing time is increased to 12 hours? (1 mark)

(a) 1.0 mm
(b) 1.5 mm
(c) 2.0 mm

No. of answers submitted: 4

Answered: 1.5 mm (Correct)

1 point

3. A binary solid-solution couple is associated with two alloys having respective initial carbon concentrations of 0.10% and 0.20% in 100 cm³ and constant scale volume of 4 cm³. Calculate the positions of the plane having concentration of 0.075% carbon. (3 marks)

$$D = \frac{D_1 + D_2}{2}$$

where:

- \( D_1 = 1.709 \times 10^{-12} \) cm²/s
- \( D_2 = 1.779 \times 10^{-12} \) cm²/s

No. of answers submitted: 2

Answered: 1.749 \times 10^{-12} \) cm²/s (Correct)

2 points

4. A solid solution in a diffusion couple was subjected to a two-step anneal at 850°C and 1000°C, then quenched, with compositions given in the table below. If the couple was not reheated at 24 hours, what should be the composition of the plane located at 100 cm³ in the diffusion zone? Assume that the scale volume and diffusivity coefficient are independent of composition. The diffusivity coefficient is given as follows (10 marks):

$$D = \frac{D_1 + D_2}{2}$$

where:

- \( D_1 = 4.020 \times 10^{-12} \) cm²/s
- \( D_2 = 4.050 \times 10^{-12} \) cm²/s

No. of answers submitted: 2

Answered: 4.035 \times 10^{-12} \) cm²/s (Correct)

4 points

### Table for ER2

<table>
<thead>
<tr>
<th>Depth (mm)</th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
</tr>
</thead>
<tbody>
<tr>
<td>Composition</td>
<td>0.10%</td>
<td>0.20%</td>
<td>0.15%</td>
<td>0.18%</td>
<td>0.22%</td>
<td>0.19%</td>
<td>0.21%</td>
<td>0.24%</td>
<td>0.26%</td>
</tr>
</tbody>
</table>

100 cm³

$$D = \frac{D_1 + D_2}{2}$$

where:

- \( D_1 = 4.020 \times 10^{-12} \) cm²/s
- \( D_2 = 4.050 \times 10^{-12} \) cm²/s

No. of answers submitted: 2

Answered: 4.035 \times 10^{-12} \) cm²/s (Correct)

4 points

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**Course outline**

How does NPTEL online unite with our courses?

### Week 1

- Week 1: Introduction to Diffusion and Diffusion Equations
- Lecture 21: Diffusion in Multicomponent Solids
- Lecture 22: Diffusion in Multicomponent Solids
- Lecture 23: Diffusion in Multicomponent Solids

### Week 2

- Week 2: Diffusion in Multicomponent Solids
- Lecture 24: Diffusion in Multicomponent Solids
- Lecture 25: Diffusion in Multicomponent Solids
- Lecture 26: Diffusion in Multicomponent Solids

### Week 3

- Week 3: Diffusion in Multicomponent Solids
- Lecture 27: Diffusion in Multicomponent Solids
- Lecture 28: Diffusion in Multicomponent Solids
- Lecture 29: Diffusion in Multicomponent Solids

### Week 4

- Week 4: Diffusion in Multicomponent Solids
- Lecture 30: Diffusion in Multicomponent Solids
- Lecture 31: Diffusion in Multicomponent Solids
- Lecture 32: Diffusion in Multicomponent Solids

### Week 5

- Week 5: Diffusion in Multicomponent Solids
- Lecture 33: Diffusion in Multicomponent Solids
- Lecture 34: Diffusion in Multicomponent Solids
- Lecture 35: Diffusion in Multicomponent Solids

### Week 6

- Week 6: Diffusion in Multicomponent Solids
- Lecture 36: Diffusion in Multicomponent Solids
- Lecture 37: Diffusion in Multicomponent Solids
- Lecture 38: Diffusion in Multicomponent Solids

### Week 7

- Week 7: Diffusion in Multicomponent Solids
- Lecture 39: Diffusion in Multicomponent Solids
- Lecture 40: Diffusion in Multicomponent Solids
- Lecture 41: Diffusion in Multicomponent Solids

### Week 8

- Week 8: Diffusion in Multicomponent Solids
- Lecture 42: Diffusion in Multicomponent Solids
- Lecture 43: Diffusion in Multicomponent Solids
- Lecture 44: Diffusion in Multicomponent Solids

### Week 9

- Week 9: Diffusion in Multicomponent Solids
- Lecture 45: Diffusion in Multicomponent Solids
- Lecture 46: Diffusion in Multicomponent Solids
- Lecture 47: Diffusion in Multicomponent Solids

### Week 10

- Week 10: Diffusion in Multicomponent Solids
- Lecture 48: Diffusion in Multicomponent Solids
- Lecture 49: Diffusion in Multicomponent Solids
- Lecture 50: Diffusion in Multicomponent Solids

### Week 11

- Week 11: Diffusion in Multicomponent Solids
- Lecture 51: Diffusion in Multicomponent Solids
- Lecture 52: Diffusion in Multicomponent Solids
- Lecture 53: Diffusion in Multicomponent Solids

### Week 12

- Week 12: Diffusion in Multicomponent Solids
- Lecture 54: Diffusion in Multicomponent Solids
- Lecture 55: Diffusion in Multicomponent Solids
- Lecture 56: Diffusion in Multicomponent Solids

### Test Transcript

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