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Courses » Phase field modelling: the materials science, mathematics and computational aspects

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Unit 13 - Week 12

Course outline

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○ Module 19 -
Lecture 75 :
Precipitate
growth II

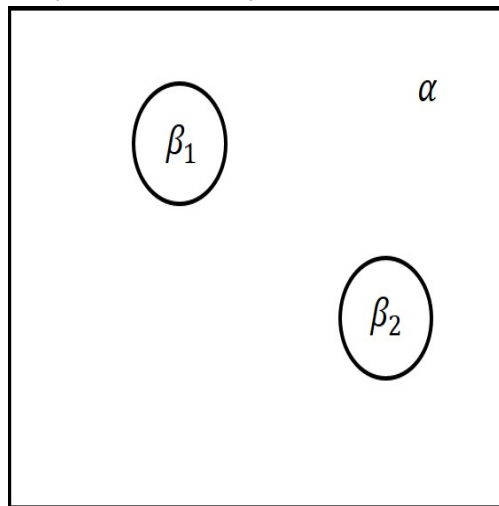
○ Module 20 -
Lecture 76 :
Grain growth:
Fan-Chen

Assignment 12

The due date for submitting this assignment has passed.

As per our records you have not submitted this assignment. **Due on 2018-10-24, 23:59 IST.**

1) A ternary system is shown in the schematic which consists of three phases (α , β_1 , and β_2) with each phases having different crystal structures and compositions c_α , c_{β_1} , c_{β_2} . The minimum number of order parameters required to model this system is



No, the answer is incorrect.

Score: 0

Accepted Answers:

(Type: String) 5

(Type: String) five

1 point

2) For the case defined in question 1 which phase field model is suitable?

1 point

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Lecture 78 :
Grain boundary
grooving I

Module 21 -
Lecture 79 :
Grain boundary
grooving II

Module 22 -
Lecture 80 :
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phase field
modelling

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Assignment 12
solution

ce De

No, the answer is incorrect.

Score: 0

Accepted Answers:

combination of Cahn-Hilliard and Allen-Cahn

3) The typical polynomial function used to interpolate in such a way that the order parameters and their derivatives go smoothly to one and zero is of order

No, the answer is incorrect.

Score: 0

Accepted Answers:

(Type: String) 5

(Type: String) five

1 point

4) Consider a polycrystalline system in which each grain is defined with different order parameter ($\eta_1, \eta_2, \dots, \eta_i$). The bulk free energy density of each grain is

1 point

- equal
- uniformly increasing
- exponentially decreasing
- cannot be defined

No, the answer is incorrect.

Score: 0

Accepted Answers:

equal

5) The expression for bulk free energy density used by Fan and Chen to model grain growth is **1 point**

-
- $$\sum_{i=1}^p -\frac{\alpha\eta_i^2}{2} + \frac{\beta\eta^4}{4}$$
-
- $$\sum_{i=1}^p -\frac{\alpha\eta_i^2}{2} + \frac{\beta\eta^4}{4} + \gamma \sum_{i=1}^p \sum_{j \neq i}^p \eta_i^2 \eta_j^2$$
-
- $$\sum_{i=1}^p -\frac{\alpha\eta_i^2}{2} + \frac{\beta\eta^4}{4} - \gamma \sum_{i=1}^p \sum_{j \neq i}^p \eta_i^2 \eta_j^2$$
-
- $$\sum_{i=1}^p -\frac{\alpha\eta_i^2}{2} - \frac{\beta\eta^4}{4}$$

No, the answer is incorrect.

Score: 0

Accepted Answers:

$$\sum_{i=1}^p -\frac{\alpha\eta_i^2}{2} + \frac{\beta\eta^4}{4} + \gamma \sum_{i=1}^p \sum_{j \neq i}^p \eta_i^2 \eta_j^2$$

6) In the expression for bulk free energy density written by Fan and Chen (asked in previous question), the condition to be satisfied by the coefficients β and γ is: **1 point**

-
- $\beta < \frac{\gamma}{2}$
-
- $\gamma > \frac{\beta}{2}$



$$\beta = \frac{\gamma}{2}$$

No, the answer is incorrect.

Score: 0

Accepted Answers:

$$\gamma > \frac{\beta}{2}$$

7) For the same expression of bulk free energy density as in previous question, if γ is **1 point** assumed to be zero (other two coefficients equal to 1), then the total number of minima of free energy for a system described by 'p' order parameters is ____? Also, if $\alpha = 1.0$, $\beta = 1.0$ and $\gamma = 1.0$, then the number of minima of the same system would be ____?



$$2p, 2^p$$



$$2^p, 2p$$



$$2, 2$$



$$p^2, 2p$$

No, the answer is incorrect.

Score: 0

Accepted Answers:

$$2^p, 2p$$

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