

Assignment-1

Heat treatment and Surface hardening – II

NPTEL-Mooc-1st week

- 1) During homogeneous solidification of a pure metal from its molten state, very low nucleation rate and very high growth rate will result into the microstructure consisting of
 - a) very coarse grains
 - b) very fine grains
 - c) mixture of fine and coarse grains
 - d) different for different metal
- 2) If the interfacial energy increases by 15%, the homogeneous nucleation barrier for spherical particle increases by_____.
 - a) 26%
 - b) 33%
 - c) 52%
 - d) 72%
- 3) If the nucleation barrier at 5°C of undercooling is 10^{-18} J, the nucleation barrier at 10°C of undercooling is_____.
 - a) 2×10^{-18} J
 - b) 4×10^{-18} J
 - c) 2.5×10^{-19} J
 - d) 5×10^{-19} J
- 4) Recrystallization kinetics for metal A at a constant temperature is such that time required for 20% and 40% recrystallization are 50 min and 63 min, respectively. The constant 'n' in the Avrami equation $x = 1 - \exp(-k(t^n))$ is _____.
 - a) 1.2
 - b) 2.1
 - c) 3.6
 - d) 5.6
- 5) In question no. 4, the constant 'k' in the Avrami equation is _____ $\times 10^{-7}$.
 - a) 1.7
 - b) 0.4
 - c) 2.8
 - d) 4.3

- 6) In question no. 4, time required for 70% recrystallization will be _____ minutes.
- a) 70
 - b) 80**
 - c) 100
 - d) 120
- 7) As compared to the growth-rate maximum, the nucleation rate maximum is at
- a) a lower temperature**
 - b) a higher temperature
 - c) the same temperature
 - d) the temperature of maximum transformation rate
- 8) A metal nucleates as sphere in a melt. If $\gamma_{sl} = 110 \text{ mJ/m}^2$ and $\Delta G_v = -10^8 \text{ J/m}^3$, the ratio of critical radius of spherical and critical edge length of cubed shape nucleus is _____.
- A) 0.25
 - B) 0.5**
 - C) 0.75
 - D) 1.0
- 9) During homogeneous nucleation of a pure metal, with decrease in transformation temperature the volume of critical nucleus
- a) first increases then decreases
 - b) first decreases then increases
 - c) decreases**
 - d) increases
- 10) During the homogeneous nucleation of a pure metal, if the nucleation rate is below the critical nucleation rate
- a) solidification takes place rapidly
 - b) solidification depends on the crystal structure of the metal
 - c) liquid remain as supercooled liquid**
 - d) None of these