

## Unit 2 - Practice Assignment

### Course outline

How does an NPTEL online course work?

### Practice Assignment

Quiz : Assignment 0

Week 1

Week 2

Week 3

Week 4

Week 5

Week 6

Week 7

Week 8

Week 9

Week 10

Week 11

Week 12

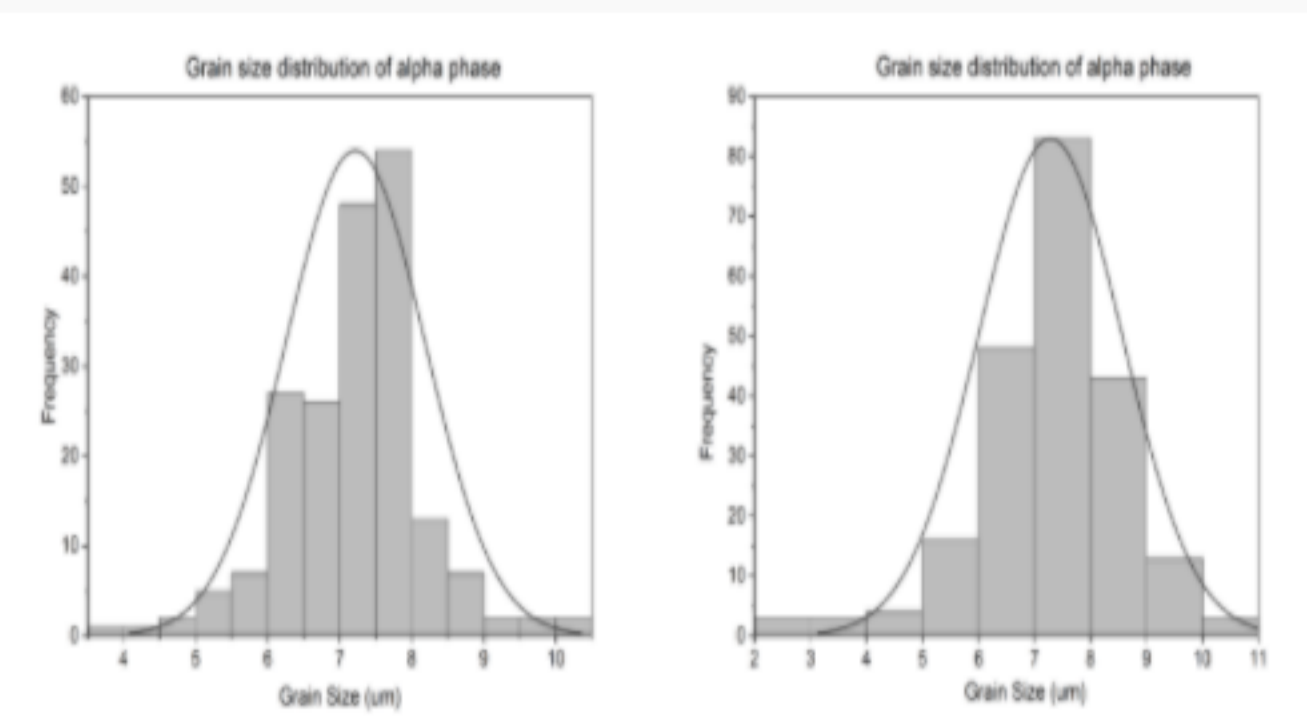
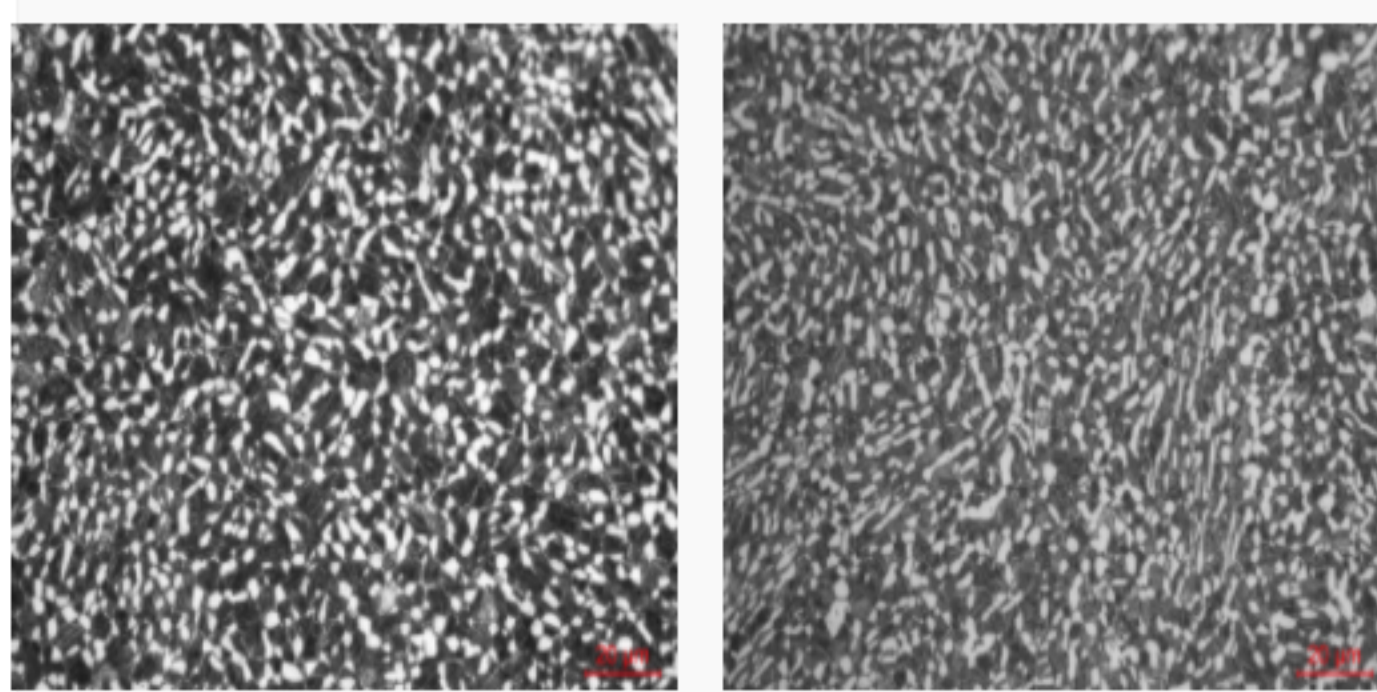
Text Transcripts

## Assignment 0

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

**Due on 2020-01-27, 23:59 IST.**

1) The figure below shows two optical micrographs of an  $\alpha - \beta$  titanium alloy. These micrographs are from two different sections of the sample; the white phase is  $\alpha$  and the dark phase is  $\beta$ . The size distribution of the  $\alpha$  particles the two microstructures are also shown in the figure. As is clear from these distributions, the average particle size of the  $\alpha$  phase is  $7.2\mu\text{m}$ . Given these two distributions, can we conclude that the two microstructures are statistically identical? **1 point**



- Yes since the average size is the same in both cases.
- No since the distribution spread is different though the averages are the same.

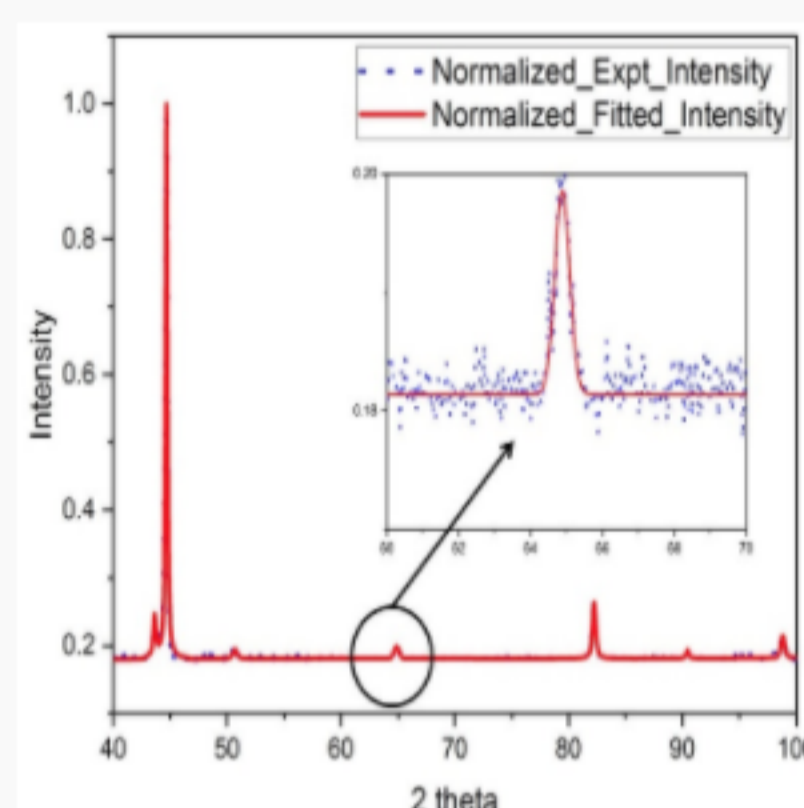
No, the answer is incorrect.

Score: 0

Accepted Answers:

No since the distribution spread is different though the averages are the same.

2) It is desired to calculate the volume fraction of a phase in a steel using X-ray diffraction. The calculation of the volume fraction involves calculating the area under each peak. In order to calculate the area under the peak, we would like to fit the peak profile to a function; specifically, a probability distribution function. Usually, which of the following functional forms is used for such a fitting exercise? **1 point**



- A weighted Gaussian and Lorentzian distribution function (also known as pseudo-Voigt)
- Weibull distribution
- Uniform distribution
- Log-normal distribution

No, the answer is incorrect.

Score: 0

Accepted Answers:

A weighted Gaussian and Lorentzian distribution function (also known as pseudo-Voigt)

3) You purchased an aluminium alloy from a company and the company claims that the yield strength of the material that they supplied you is  $120 \pm 3$  MPa. Suppose you take four random samples from the supplied material and test the strength for yourself, and you obtain the values of 123, 117, 120 and 115 MPa. Do you think your data broadly supports the claim of the company? **1 point**

- Yes; because the mean yield strength of closer to the reported yield strength and the standard deviation is also not very different
- No because you did not obtain 120 MPa from your tests
- No because you did not obtain 3 MPa as the standard deviation
- No because both the mean and standard deviations from your test are different

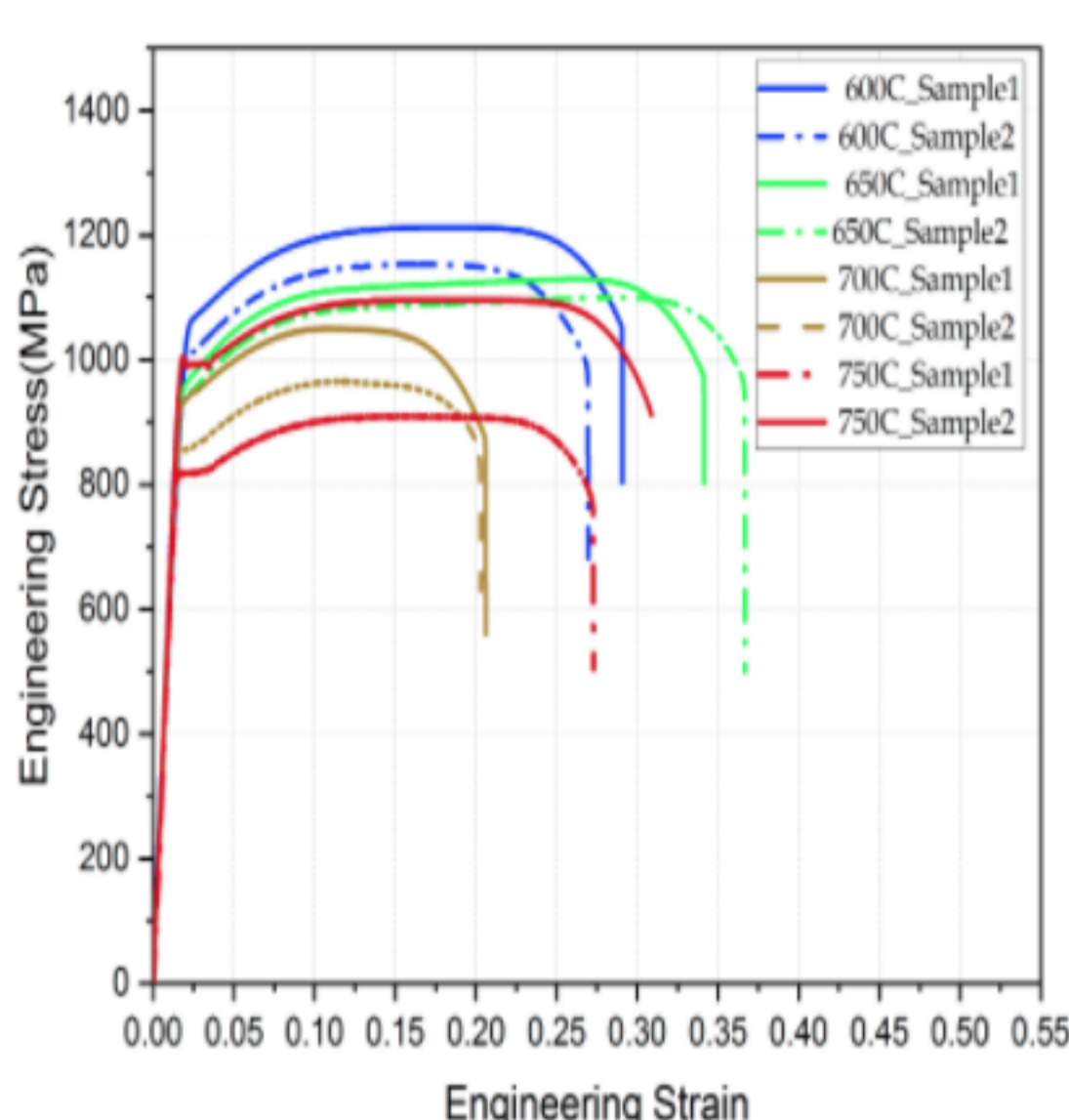
No, the answer is incorrect.

Score: 0

Accepted Answers:

Yes; because the mean yield strength of closer to the reported yield strength and the standard deviation is also not very different

4) Four steel samples have been heat treated at four different temperatures, namely, 600, 650, 700 and 750°C. For every heat treated condition, two tensile tests were carried out. The graphs below show the stress-strain behaviour of these samples. Which of the following conclusion(s) broadly follow(s) from these graphs? **1 point**



- The ultimate tensile strength decrease with increase in heat treatment temperature.
- The ultimate tensile strength increase for heat treatments upto 700°C and decreases for heat treatments at higher temperatures
- We cannot conclude the trend as the two samples heat treated at 750°C data do not show consistent trend
- The 750°C heat treatment experiment should be repeated before analysing the trends

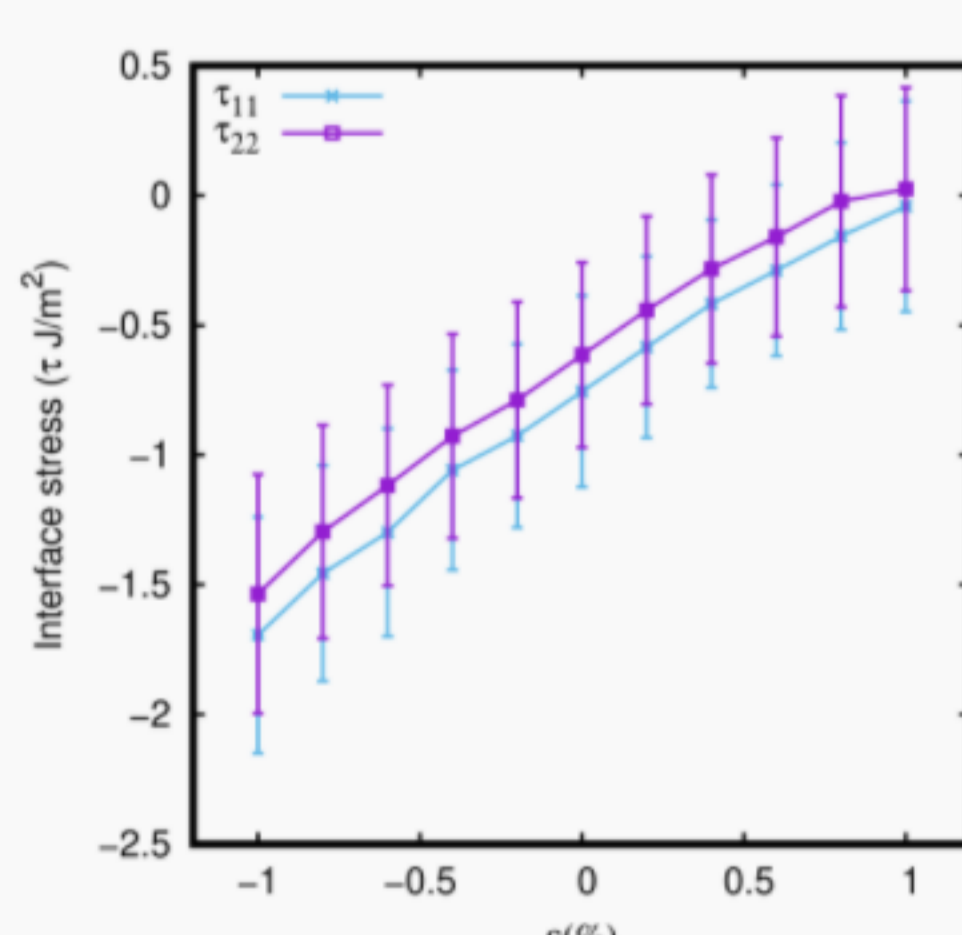
No, the answer is incorrect.

Score: 0

Accepted Answers:

We cannot conclude the trend as the two samples heat treated at 750°C data do not show consistent trend  
The 750°C heat treatment experiment should be repeated before analysing the trends

5) The interface stress at a solid-liquid interface is calculated using molecular dynamics simulation and the plot of the interface stress as a function of the imposed strain is shown in figure. The  $\tau_{11}$  and  $\tau_{22}$  designate the xx and yy stress components. From the graph, can we conclude that  $\tau_{11}$  and  $\tau_{22}$  are (statistically) the same? **1 point**



- Yes since the error bars overlap
- No since the plots do not overlap

No, the answer is incorrect.

Score: 0

Accepted Answers:

Yes since the error bars overlap

6) The microstructure of an age-hardenable alloy consists of plates of square cross-section, with broad faces of the plates aligned along the (100) planes of the matrix. In the 2D section of the microstructure, seen under a microscope, **1 point**

- The precipitates will be not only square but also rectangular in shape
- All the precipitates will be squares (of same area)
- All the precipitates will be thin rectangles (of same area)

No, the answer is incorrect.

Score: 0

Accepted Answers:

The precipitates will be not only square but also rectangular in shape