

Hwk 6, Q&A

16th March 2016

One of the strain tensors provided in question 3 of the homework is not symmetric. This will inform the rest of my questions. Would you please comment on my understanding, given below?

1. The formula for $d\omega$ on slide 63 (L11), which includes factors of 2, is for symmetric strain tensors only. Thus, for asymmetric strain tensors, one should use the formula for $d\omega$ found on sl. 64, which does not include factors of 2. This is confirmed by checking the hint answers.

Yes, correct.

2. For asymmetric strain tensors, the condition that von Mises strain must $= 1$ does not apply.

Yes indeed. I cannot remember, now, why I had that remark about the vM equiv strain needing to be $= 1$. It's been removed from the notes.

3. For the stress tensor given which is not symmetric, one cannot apply the formula for von Mises strain on sl. 68 which has three red asterisks by it ("only for the symmetric form of ϵ ").

Yes, correct.

4. Von Mises strain should not change when calculated from different orientations of the same strain tensor (one initial strain tensor, which is then transformed by different $(hkl)[uvw]$ combinations).

Yes, correct.

5. Finally, is $\text{trace}(\text{transpose}(e) * e)$, where e is a 3×3 matrix, an acceptable way to calculate the inner product $(e : e)$?

Yes. The inner product, $e:e$, is a sum of pairs of like coefficients, $c_{11}c_{11} + c_{22}c_{22} + \text{etc.}$ (9 terms). The leading diagonal of a square matrix multiplied by its transpose gives $c_{11}c_{11} + c_{21}c_{21} + c_{31}c_{31}, c_{12}c_{12} + c_{22}c_{22} + c_{32}c_{32}, c_{13}c_{13} + c_{23}c_{23} + c_{33}c_{33}$, and so the trace is the same (9 products, again).