


Exercise 3.2-1

Crystal Identity

Illustration

Every now and then an atom in a crystal makes a jump to a neighboring place via its self-diffusion mechanism. After some time, we must expect that - on average - every atom has left its original place. Somehow we now have a different crystal. What then constitutes the "Crystal Identity"?

- Calculate how long it takes (on average and with simple approximations) until *every* atom in a crystal has made *one* jump as a function of the temperature and the relevant point defect parameters.
- Use the formula that gives the jump frequency of the atoms which are able to make a jump. Consider what must happen so *all* atoms can jump eventually.
- Discuss the results for some crystals of your choice. You may use the [data provided](#) in the script.

 [Link to the Solution](#)

That this question is a bit philosophical becomes apparent if you substitute "brain" for crystal. It is known (from tracer techniques not unlike the ones used for studying diffusion) that most of the atoms that form your brain *now* will have disappeared after some weeks or month and *other* atoms of the same kind took their place (that's partially why you must eat!). Yet *your* identity seems completely unchanged.