

3.091 Solid State Chemistry: Week 1

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Progress Update

Over the past week I have:

- 1 Reviewed basic chemistry topics.
- 2 Introduced Brownian motion and how it motivates the idea of always-moving particles.
- 3 Further developed the idea of oxidation states & redox reactions.

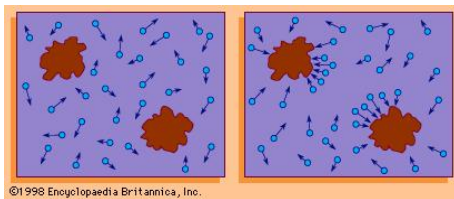
Basic chemistry topics reviewed

I have reviewed the following chemical concepts using the examples following:

- 1 Limiting reactant problems - Lavoisier and tin oxide
- 2 Balancing chemical equations - Combustion of H_2 with O_2 , reduction of antimony.
- 3 Ideal gas law - $1/5$ pressure $\implies 5 \cdot$ volume

Brownian Motion

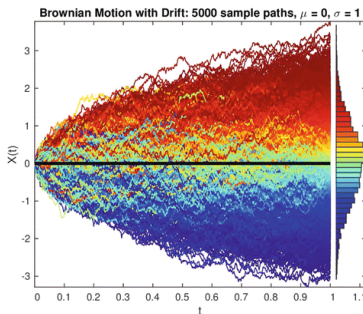
The observation that led us humans to recognize that matter is made of trillions of particles. In 60 B.C., Lucretius recognized that in the bottom of a cup he was closely observing, dust would randomly jump around. This occurred despite the water being perfectly still.



He proposed then, and we can now prove, that the vibrating & imperceptibly moving particles of water would interact and move the dust about.

Aside: Random Walk

I noticed that this graph of Brownian motion



is remarkably similar to a random walk! I also recognized that this has an outline like $\pm\sqrt{x}$.

Reduction & Oxidation

A few definitions:

- 1 Oxidation - the loss of charge (gaining of an electron) by an atom or molecule.
- 2 Reduction - the gaining of charge (loss of an electron) by an atom or molecule.

We are told, and it is true that, the sum of the oxidation states in a molecule must equal the sum of all charges of all atoms in a molecule.