A FOLLOW UP ON CHEMICAL REACTONS VS. PHYSICAL CHANGES

Assuming you have done the readings up to page 75 of your notes, you might know a fair amount about chemical reactions and physical changes….

In past classes, however, I have been asked about alloys (solid, metallic solutions)… And one year, I was even asked about amalgamation! (I have no idea, where that question came from … but it is a goodie!). **So, for tonight, I thought I would take some time to discuss amalgamation a bit, and push the idea of physical change vs. chemical change a bit more, before moving on to the terms, exothermic and endothermic.**

There are also two really cool new videos to watch. I have a third video as well, which is really made for kids … but I must admit, it is really well done. It gives you many of the visual clues to look for regarding chemical reactions and physical changes.

If you struggled with the notes regarding chemical reactions and physical changes, try watching this little video. As Einstein said … “Everything should be made as simple as possible, but no simpler”. Don’t be turned off by the source … the information is pretty good! **Also, I think this video may help you master this lesson’s ideas of describing a reaction or a physical change as exothermic / endothermic.**

Take a look at: Chemical Reactions vs. Physical Changes: <https://www.youtube.com/watch?v=x49BtB5dOwg>

Okay, now onto Amalgamation ….

Amalgamation is an interesting and valuable process in chemistry. The amalgamation process essentially is the name given to mixing (or alloying) mercury with other metals. Even though it all looks very “chemical reaction-like”, I see it very much as a physical change.

The value to the process is that it can make the “other metal” into which the mercury dissolves, lose electrons more easily. (It allows the other metal to become more easily oxidized). Thus, amalgamation helps to more speedily reduce compounds. The mercury facilitates the transfer of electrons.

Again, the amalgamation process looks like a chemical reaction, but it is more classically classified as a physical change … It uses terms, such as “mercury dissolving into the metal” … with the term, ***dissolving***, as a clue to the nature of the physical change.

So, an amalgam is just the specific name given to an alloy of some metal, with mercury. And, we have mentioned in class, that alloys, are just solid solutions with metals.

The properties of an alloy (and that would include amalgams) are very often rather different than the metal components. The ratio of the metals to each other is pretty flexible. Since there is no fixed ratio, between the components, chemists say that no new compounds are produced. Hence, a mixture (flexible ratios between components) is made, and not a new compound.

The video, found at: <https://www.youtube.com/watch?v=IrdYueB9pY4> is a clip showing the amalgamation of aluminum metal. To be honest … **I simply wished to introduce it to you, as it is one of those very cool demos in chemistry.** I would **NEVER** do it in class, as mercury is so very dangerous … but a video, makes it easy! It’s about 8 minutes … and is pretty cool to watch…

In the video, once the mercury dissolves into the metallic aluminum, the aluminum is converted to aluminum oxide … Now, that IS a chemical reaction … the aluminum metal was oxidized to Al3+ in the presence of oxygen.

**4 Al + 3 O2 🡪 2 Al2O3 + energy**

**Side Note: Notice, the above is a chemical reaction (new bonds are made) and energy is released …** Energy is a product … It is leaving the chemicals and entering the surrounding air (or water). Thermal Energy (***thermic***) is exiting (***exo***) the chemicals … making this an exothermic chemical reaction! When the energy concept is on the product side it is an exothermic issue. When energy is on the reactant side, it is an endothermic (endo-inner) issue … just like we have an *endo*skeleton… a skeleton on the inside. When more energy is pumped into the chemical system, than released, we call it endothermic.

But, the mixture of mercury with the aluminum is physical. The chemical reaction is A CONSEQUENCE of the amalgamation process. That consequence is that aluminum metal is MORE EASILY reacted with oxygen gas. Thus, the mercury facilitated the exchange of electrons from aluminum metal to the surrounding oxygen air (the redox reaction).

**I would tend to describe amalgamation, like I would describe table salt (NaCl) dissolving in water. Per your notes and/or the video about physical changes, you should know, by now that this is simply a physical change, in which water disrupts the ionic bond between Na+1 and Cl-1 ions.**

Well, mercury disrupts the (metallic) bonds between aluminum atoms in a similar way … making it easier, in turn, for the aluminum to actually react with other materials, like water, oxygen etc….

**So, physical amalgamation can lead to a legitimate chemical reaction … A little complex… but I think you get the idea…. The chemical reaction is a consequence of the physical amalgamation.**

Now, to see an honest-to-good CHEMICAL REACTION … take a look at Lonnie’s Lab. (Lonnie does some pretty darn cool stuff … I think he’s located at MIT.

Lonnie’s Lab: NaCl Formation: <https://www.youtube.com/watch?v=d2geiGKFveE>

The production of NaCl is very **exothermic** … That is, as the new ionic bonds are produced, the

potential energy decreases and is converted into thermal energy and released into the surrounding atmosphere.

Tonight’s work is about the terms: **exothermic and endothermic …**

So, in order to master your grasp of the terms, exothermic and endothermic, take a look at pages 76-79 (You can stop at part V) about bonding.

For practice with the terms exothermic and endothermic … you may (but do not need to) try the TRY THIS on pages 88-89.

Once done, try the questions on Chemical Reactions vs. Physical Changes and send it onto me, for points.