conceptual chemistry

6.6 polar covalent bonds result from an uneven sharing of electrons //極性共價鍵

1)"*evenly*": if the two atoms that form a covalent bond are the same, then y have the same positive charge, so electrons are shared evenly.

We can illustrate this by putting two electrons right between the two atoms: $\mathrm{H}:\mathrm{H}$, or draw a probability cloud.

如果組成共價鍵的兩個原子是同一種元素，則核內的正電一樣大，電子就會被兩個原子平均的享有。

可以在電子點式（上面那個，我不確定他叫什麼）裡把兩顆電子放在正中間，或畫一個左右對稱的機率雲。

2)"*unevenly*":electrons are more attracted by one of the two atoms, $\mathrm{H}-\mathrm{F}$ etc.(electrons are more attracted by F, like this: $\mathrm{H}\ :\ \mathrm{F}$).

基本上就跟上面那個相反。例子是氟化氫氣體。//其他例子：氨氣

3)"*DIPOLE*":In this case, electrons spend more time around F atom. Therefore, F side of the bond is a little bit negative. On the other hand, H side of the bond is a little bit positive because electrons have been dragged away. This separation of charge is called "*DIPOLE*", represented by"$\delta-$" &"$\delta+$", and also"$\overset{\delta+}{\mathrm{H}}-\overset{\delta-}{\mathrm{F}}$"or"$\overrightarrow{\mathrm{H}-\mathrm{F}}$".

在前面那個例子裡，電子會比較靠近氟原子，因此氟原子附近呈現些微負電（H端完全相反）。這種現象被稱為「鍵偶極」。鍵偶極可以有上方的表示方法。

//電偶極：有兩個相聚一段距離，電量相等、電極相反的電荷構成的電場。

//https://www.youtube.com/watch?v=yAIDwxpqEu0

4)"*electronegativity*": how strong an atom is able to drag an electron towards itself when bonded. The farther apart two atoms are in the periodic table, the greater difference between their electronegativity, and the more polarity of the bond between them.

電負度。兩個原子在週期表中相隔越遠，電負度差距越大，共價鍵極性越強。

//Note: the electronegativity of ionic atoms can also be calculated.

5)differences between ionic & covalent bond: there is no black & white distinction between the two types of bond. Instead, there is a gradual change between them. Atoms on the opposite side of the periodic table have the greater differences between electronegativity. Therefore, the bond between them are highly polar—in other words, *IONIC*.

共價鍵跟離子鍵之間並沒有明確的分野，他是一個漸進的過程。隨著兩種原子在週期表上相距越遠（=性質差異越大），化學鍵的極性便越強，甚強者即稱為離子鍵。極性共價鍵介於離子鍵和非極性共價鍵之間。

6.7 molecular polarity results from an uneven distribution of electrons //電子分配不均造成的極性分子

1)if all the bonds in a molecule is non-polar, the molecule is also non-polar. $H_2$, $O_2$, $N_2$ etc.

如果分子裡的鍵結都是非極性，那麼通常而言，分子也是非極性的//

exception: $O_3$ etc.

2)if a molecule which only have two atoms, and the bond between them is polar, the polarity of the molecule is the same as the polarity of the bond. HF, HCl, ClF etc.

對於雙原子分子，分子的極性與鍵結相同。

3)as for molecules with more than two atoms, things become complicated. Consider $CO_2$, for instance($\overleftarrow{O = C} = \overrightarrow{O}$). The two oxygen atom pull toward the opposite side(with the equal strength). So, the dipoles cancel each others, that results to an even distribution of electrons.

//another example: $BF_3$.

對於多原子分子，情況比較複雜：在二氧化碳的例子中（圖如上，且三原子共線），氧原子的鍵偶極矩相互抵銷，因此總體呈現非極性。

//鍵偶極矩：https://www.youtube.com/watch?v=NdXvuLhwiLA

Non-polar molecules have weaker attractions to other non-polar molecules in comparison to the attractions from bonds inside the molecules. This lack of attraction result to the low boiling point of many non-polar substance(because lack of attraction leads to the less heat energy required

to separate molecules from one another). $H_2$, $O_2$, $N_2$ etc. also have lo boiling point because of the same reason.

非極性分子之間的吸引力較弱（相較於鍵結的吸引力），因此非極性物質通常擁有較低的沸點（因為要把分子分開所需要的能量更小）。

4)there are many other cases that dipoles of bonds do not cancel each other. When the strength between each bond around e not the same, or the angles between bonds are not specific numbers. $H_2O$ is one of the examples(我就不畫圖了). Because of the bent shape of the molecule, the dipoles do not cancel each other. Water molecules attract another because each contains a slightly positive and negative side. Polar molecules become "*sticky*", so it takes more energy to separate them apart and to get to gaseous phase.

在某些時候，鍵偶極矩並不相互抵銷，導致整個分子變成極性（就是力不平衡的概念），彼此之間產生吸引力。這讓極性分子擁有較高的沸點（e.g. $H_2O$ v.s. $CO_2$）。