

# Induction Effect

In molecules with covalent polar bonds, i.e. bonds where the difference electronegativity ( $\Delta x$ ) is greater than 0.4, partial charges occur. A positive partial charge arises on an atom with a lower electronegativity, a negative partial charge on an atom with a higher electronegativity. In the HCl molecule, therefore, the positive partial charge arises on the hydrogen atom ( $x = 1$ ), the negative partial charge on the chlorine atom ( $x = 2.8$ ). The shift of electrons along the  $\sigma$  bond (*sigma*) is called the '*induction effect*'. There is a positive and negative induction effect.<sup>[1]</sup>

## Positive induction effect

It occurs when the central atom of the functional group has a lower electronegativity than the carbon inside the chain. A positive induction effect is caused, for example, by the groups  $-\text{PH}_2$ ,  $-\text{SiH}_3$  or  $-\text{SH}$ .

*ethyl mercaptan*  $\text{CH}_3^{\delta-} \leftarrow \text{CH}_2^{\delta-} \leftarrow \text{SH}^{\delta+}$

## Negative induction effect

It is caused by the higher electronegativity of the central atom of the group than the carbon inside the chain. Typical examples are halogens ( $-\text{F}$ ,  $-\text{Cl}$ ,  $-\text{Br}$ ,  $-\text{I}$ ),  $-\text{OH}$ ,  $-\text{NH}_2$  or  $-\text{NO}$ .

*1-chloropropane*  $\text{CH}_3^{\delta\delta+} \rightarrow \text{CH}_2^{\delta\delta+} \rightarrow \text{CH}_2^{\delta+} \rightarrow \text{Cl}^{\delta-}$

## Source

- interpretation of the teaching staff of the Ecclesiastical Gymnasium in Pilsen

## References

1. {{#switch: book |book = *Incomplete publication citation*. BANÝR, George and Paul BENEŠ. *High School Chemistry: (General, Inorganic, Organic, Analytical, Biochemistry)*. Prague : SPN, 1999. 160 s. 978-80-7262-438-6. |collection = *Incomplete citation of contribution in proceedings*. BANÝR, George and Paul BENEŠ. *High School Chemistry: (General, Inorganic, Organic, Analytical, Biochemistry)*. Prague : SPN, 1999. 160 s. {{ #if: 8085937468 |978-80-7262-438-6} } |article = *Incomplete article citation*. BANÝR, George and Paul BENEŠ. 1999, year 1999, |web = *Incomplete site citation*. BANÝR, George and Paul BENEŠ. SPN, ©1999. |cd = *Incomplete carrier citation*. BANÝR, George and Paul BENEŠ. SPN, ©1999. |db = *Incomplete database citation*. SPN, ©1999. |corporate\_literature = BANÝR, George and Paul BENEŠ. *High School Chemistry: (General, Inorganic, Organic, Analytical, Biochemistry)*. Prague : SPN, 1999. 160 s. 978-80-7262-438-6} }

