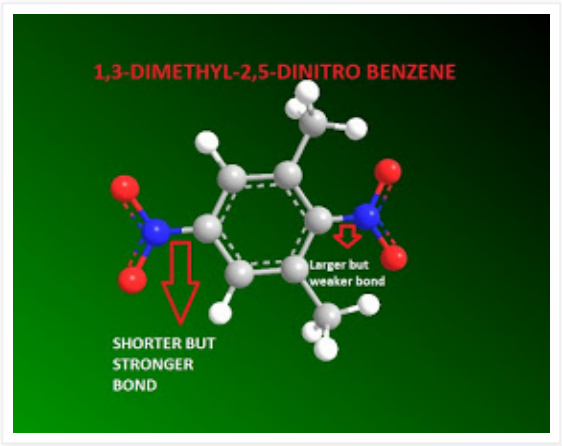
Tuesday, February 12, 2019

How steric inhibition of resonance influence bond length, m.p and dipole moment of an organic compound.

How steric inhibition of resonance influence on bond length and bond strength ?

Owing to the involvement of **resonance**, a single bond assumes a partial double bond character while a double assumes a partial single bond character. If **steric effect** inhibits resonance the shortening or lengthening of such a bond does not occur.



Since shortening of a bond increases its strength and lengthening of a bond decreases the strength that is **steric inhibition of resonance** changes the strength and lengthy of a particular bond.

For example, **C – N bond** 'a' is shorter than C – N bond 'b' and hence the former is stronger than the later of **1,3-dimethyl-2,5-dinitro benzene** compound .

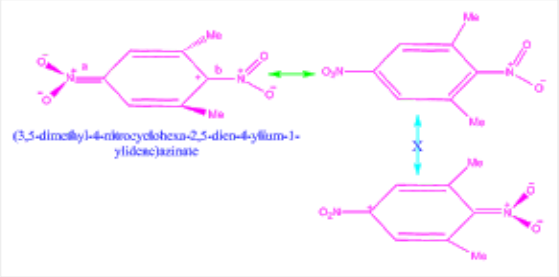
In this compound , due to the **steric inhibition of resonance** involving two methyl and one nitro groups , the oxygen atoms of the nitro group and the vacant p-atomic orbital of it N-atom are sterically forced out of their planes.

Thus, the **– I effect** of the nitro group can not play its role and the C – N bond fails to assume a **partial double bond character .**

On the other hand the **vacant p-atomic orbital** of the p-nitro group and its oxygen are on their usual planes because of the absence of **steric inhibition of resonance.**

So the **C – N bond** 'a' has a partial double bond character because of the **- R effect** of the nitro group .

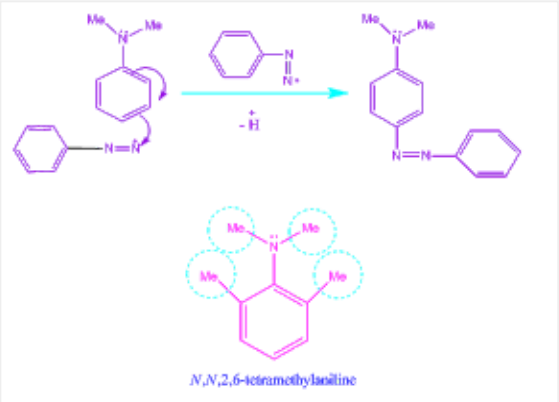
Therefore , the bond ‘a’ is shorter than the bond ‘b’ and hence the former is stronger than the later.



How steric inhibition of resonance influence on reactivity of organic compound ?

Owing to **steric inhibition of resonance** , electronic charge density decreases at a particular carbon atom of an aromatic compound, that is , its **nucleophilicity** decreases.

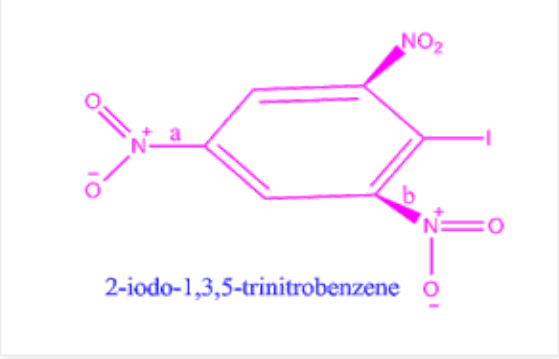
Therefore, reactivity of the compound as a nucleophile decreases.
For this reason, **N,N,2,6 tetra methyl aniline** does not couple with benzene diazonium ion.

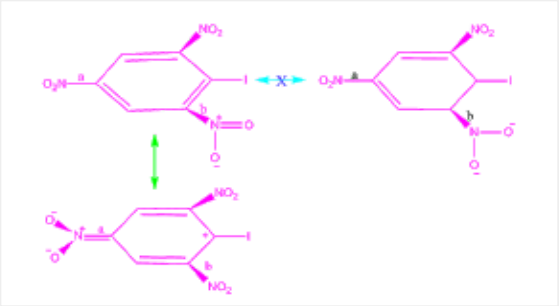


Why in compound 2-iodo-1,3,5-trinitrobenzene the C – N bond in 5-position is shorter and stronger than the C – N bond in 3-position ?

In **2-iodo-1,3,5-trinitro** benzene compound the bond b does not have a partial double bond character due to the **steric inhibition** of resonance , whereas the bond ‘a’ in this compound has a partial double bond character because of the absence of the **steric inhibition of resonance.**

Therefore, the bond ‘a’ is shorter than and stronger than the bond ‘b’ of this compound.

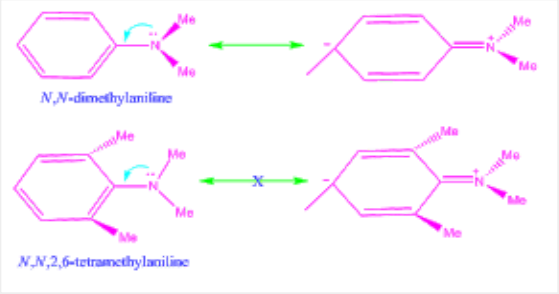




How steric inhibition of resonance influence the dipole moment of an aromatic compound ?

Steric inhibition of resonance in an aromatic compound lower its **dipole moment** . Since the distance between the two poles of such a compound is shorter than that in a similar compound without **steric inhibition of resonance .**

For example the dipole moment of **N,N dimethyl aniline(1.61D)** is greater than that of **N,N,2,6 tetra methyl aniline (0.94 D).**

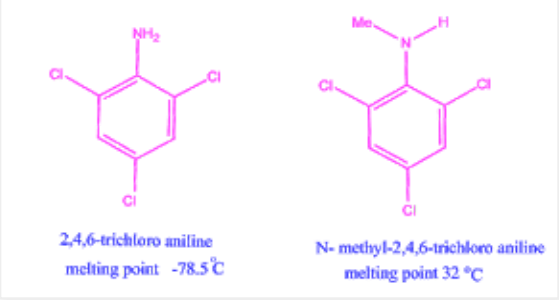


How steric inhibition of resonance influence the melting point and boiling point of an aromatic compound ?

Due to the **steric inhibition of resonance** the nuber of ionic resonating structure of a compound less than compound without steric inhibition of resonance.

As a consequence compound of the later category are more ionic than those of the **former category.**

Thus, for the later compound melting point and boiling point will be higher than the former compound.



Summary:

How steric inhibition of resonance influence bond length, bond strength, melting point and dipole moment of organic compound.

Click here: What is steric inhibition of resonance.

BY P GHOSH at February 12, 2019

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