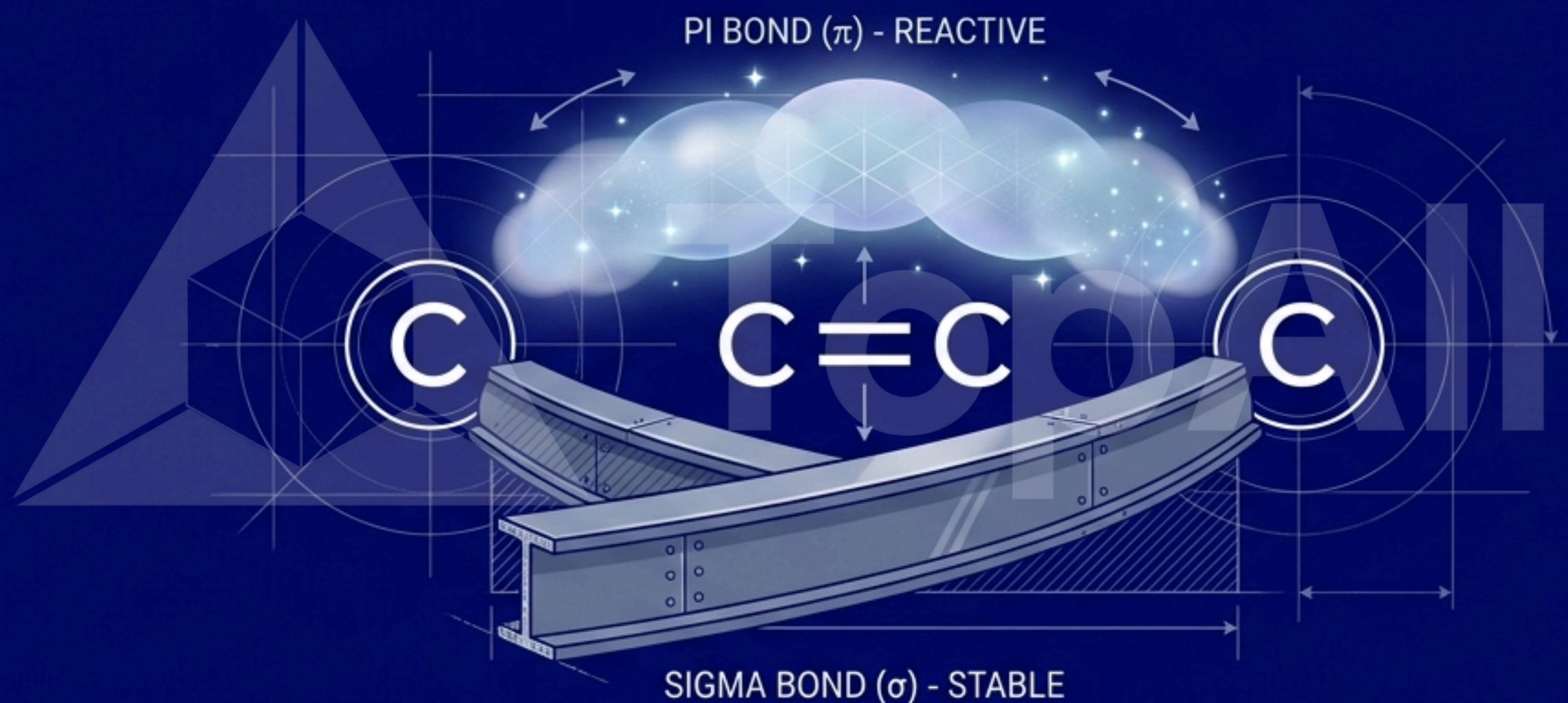


A DOUBLE BOND IS NOT TWO IDENTICAL BONDS



The carbon-carbon double bond is a hybrid system built from two entirely different physical phenomena.

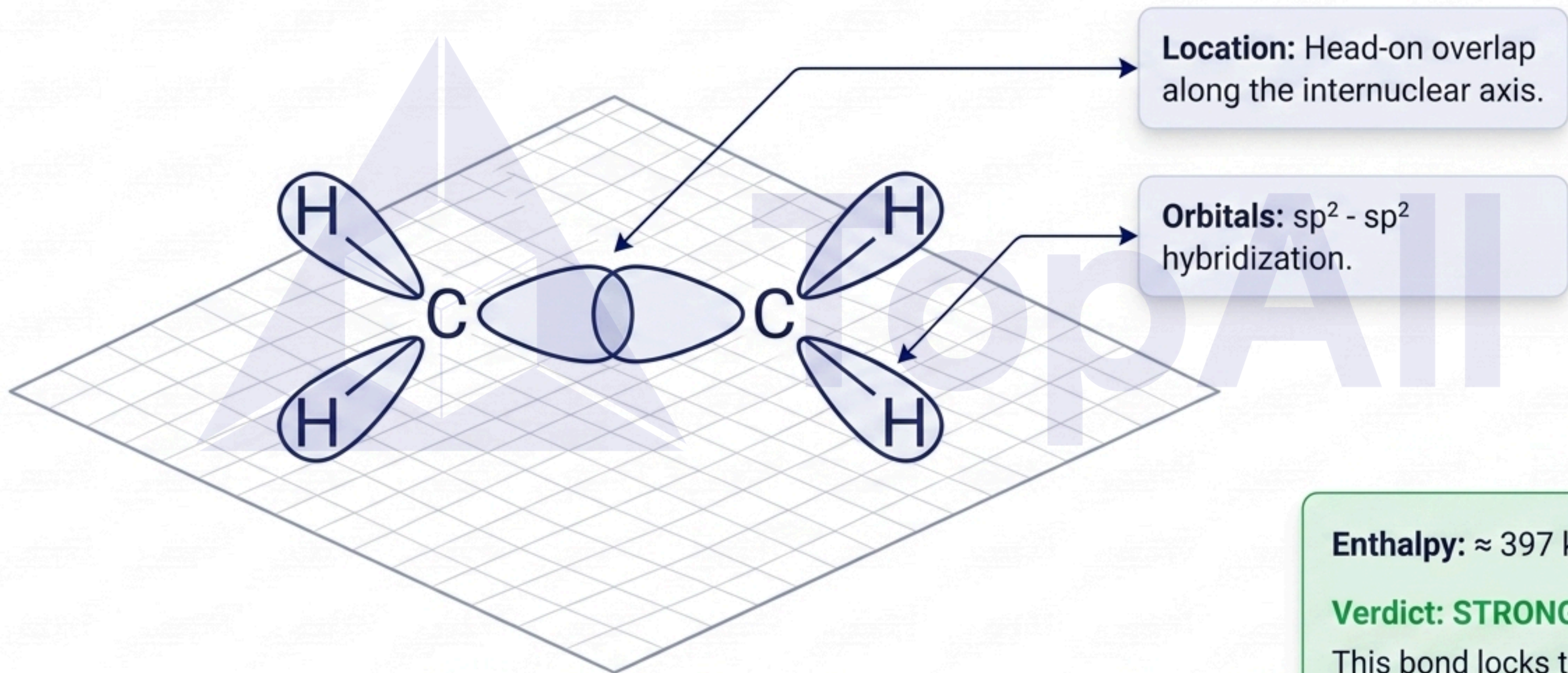
The Reactive Shell (Weak)



The Structural Core (Strong)

To master alkene reactivity for JEE, you must analyze these two bonds in complete isolation before combining them.

The Foundation: The Sigma (σ) Bond



Enthalpy: $\approx 397 \text{ kJ mol}^{-1}$

Verdict: STRONG.

This bond locks the carbon framework in place.



You've Learned the Theory. Let's Test Them Now.

$$E=mc^2$$



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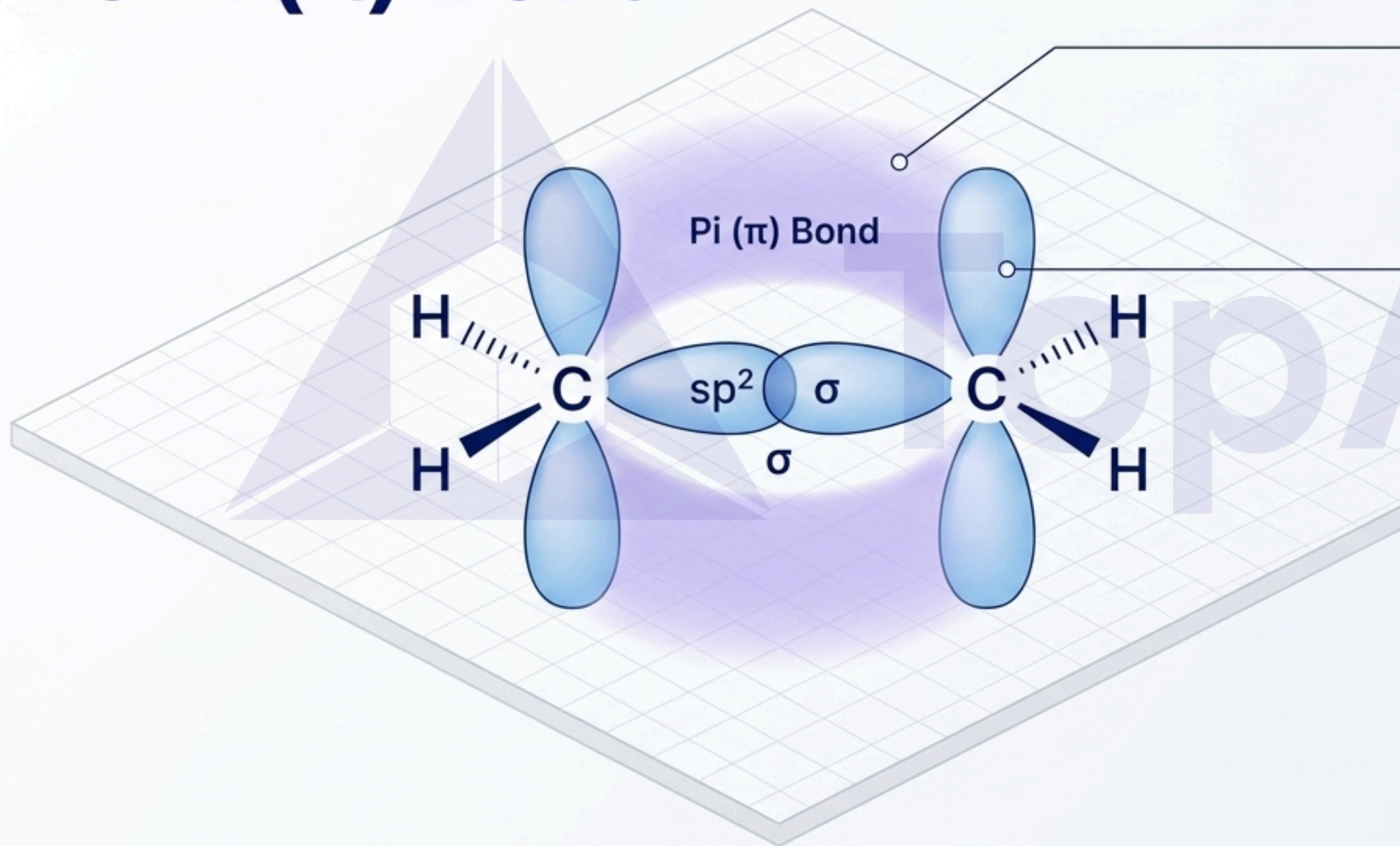
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- » Get Clear Explanations, Not Just Marks
- » Track Your Performance Smarter



The Vulnerability: The Pi (π) Bond



Location:

Lateral (sideways) overlap above and below the plane.

Orbitals:

Unhybridized $2p - 2p$ orbitals.

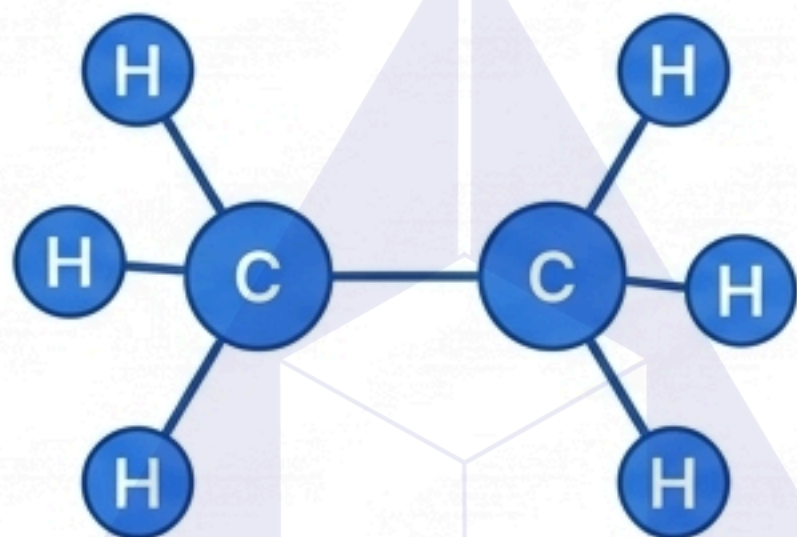
Amber Warning

Enthalpy: $\approx 284 \text{ kJ mol}^{-1}$

Verdict: WEAK & EXPOSED.
Poor sideways overlapping creates a loosely held source of mobile electrons.

System Synthesis: Bond Length & Strength

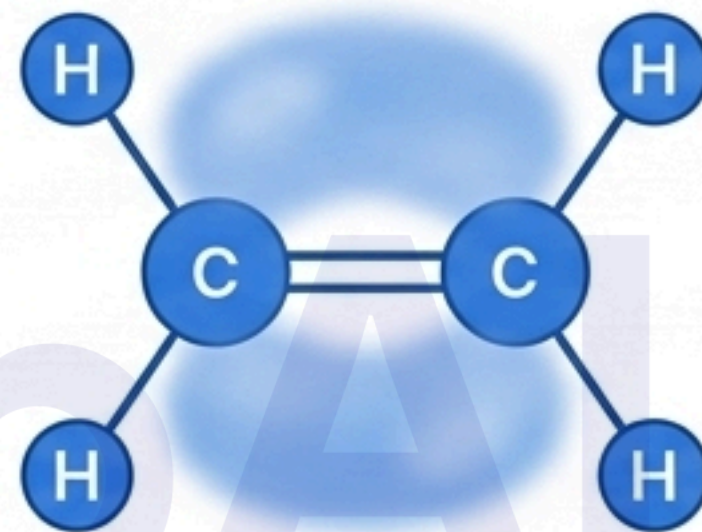
Ethane (C–C)



Length: 154 pm

Total Enthalpy: 348 kJ mol⁻¹

Ethene (C=C)



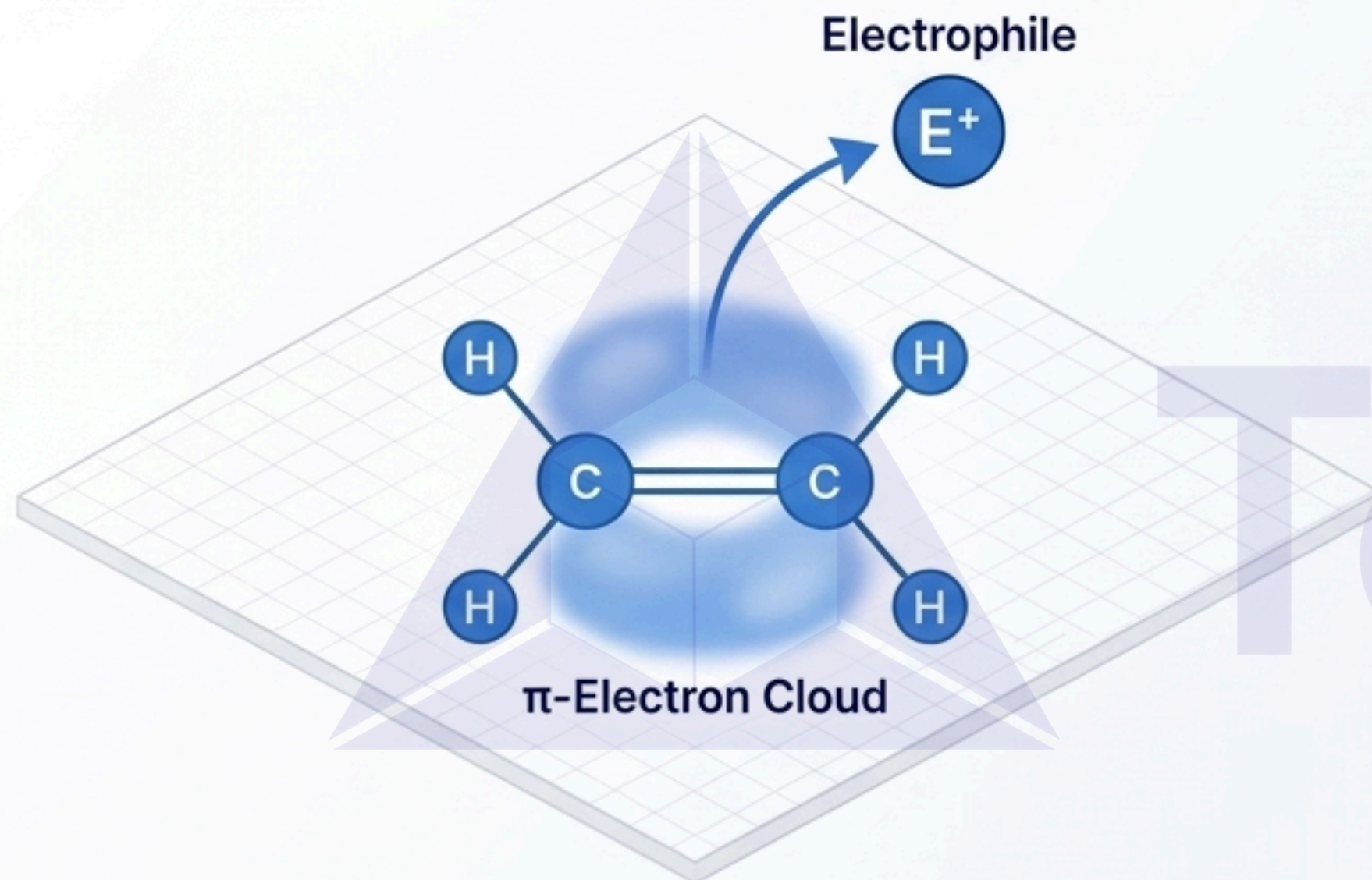
Length: 134 pm

Total Enthalpy: 681 kJ mol⁻¹ (397 + 284)

Key Insight

The double bond is shorter and stronger overall because the combined pull of the σ and π overlapping pulls the carbon nuclei closer together.

Chemical Consequence & The JEE Trap



π -Electron Cloud $\rightarrow$ Electrophilic Attack

The exposed, loosely held π electrons act as a magnet for electron-seeking reagents.

Alkene $\rightarrow$ single bond compound.

! JEE Trap Alert

The Trap:

Assuming alkenes are **less reactive** than alkanes because their **total bond enthalpy** (681 kJ/mol) is higher than a single bond (348 kJ/mol).

The Reality:

Reactivity is dictated by the **weakest link**, not the total sum. The **highly exposed, weak π bond** (284 kJ/mol) **breaks easily**, making alkenes **highly unstable** and **reactive** compared to alkanes.



You've Learned the Theory.

Now Let's Test It.

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