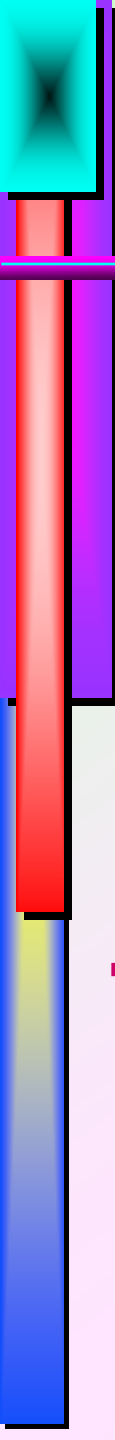


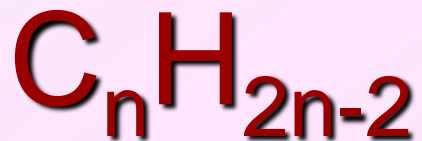
**ALKYNES**



**A member of the hydrocarbon family containing a carbon-carbon triple bond as the functional group**

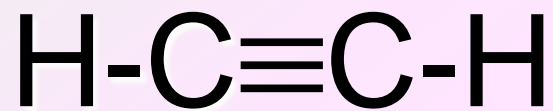


Alkynes have  
triple bonds



Formulas for  
alkynes show a  
hydrogen  
deficit of two

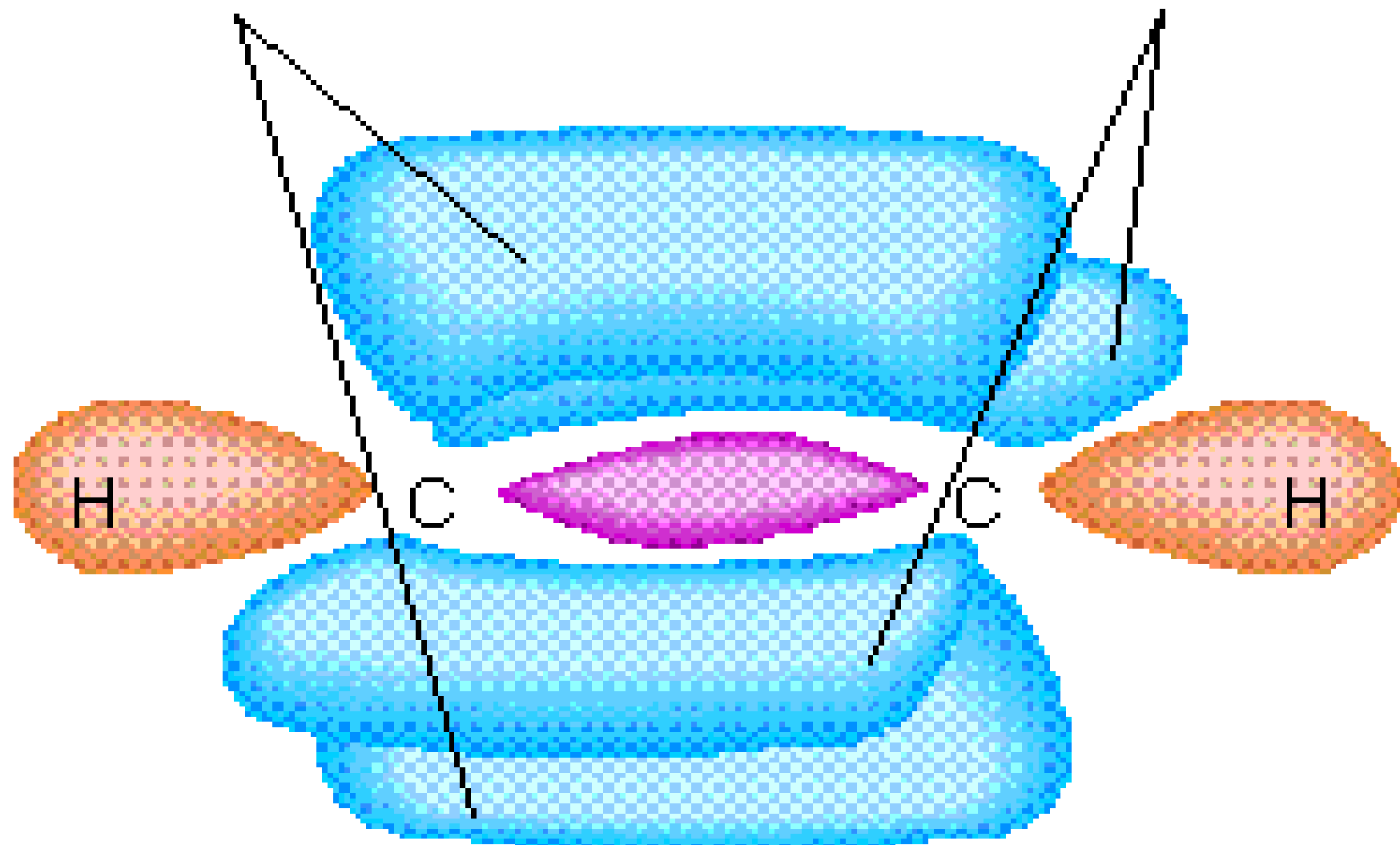
# Acetylene



- ◆ **Simplest member of the alkyne family**
  - ✦ **linear arrangement**
  - ✦ **sp hybridization**
  - ✦ **2  $\pi$  bonds & 1  $\sigma$  bond**

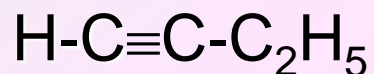
One  $\pi$  bond

Second  $\pi$  bond

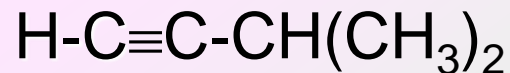


# Nomenclature

- ◆ **Common Names: Derived from acetylene due to replacement of one or both hydrogen atoms**



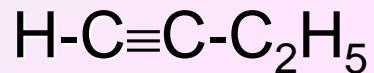
Ethylacetylene



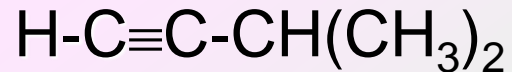
Isopropylacetylene

# Nomenclature

- ◆ IUPAC Names: Name the carbon group and use the **-yne** ending



1-Butyne



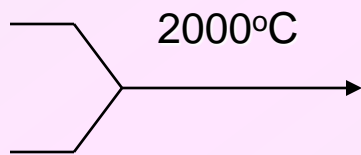
3-methyl-1-butyne

# Industrial Source of Acetylene

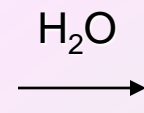
A.

coal → coke

limestone → CaO



CaC<sub>2</sub>

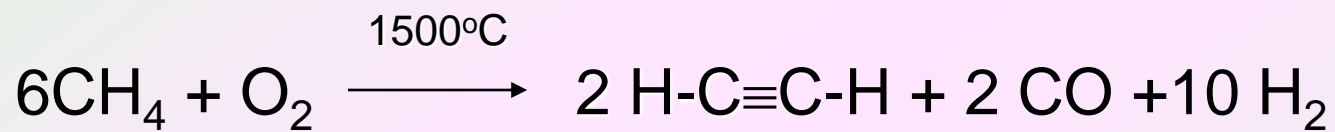


H-C≡C-H



# Industrial Source of Acetylene

B.



# Physical Properties

- ◆ **Low Polarity**
- ◆ **Similar to alkanes and alkenes**
- ◆ **Insoluble in water**
- ◆ **Soluble in organic solvents**
- ◆ **Less dense than water**
- ◆ **Boiling points -- Table 12.1 page 428**

# Physical Properties

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- ◆ **Soluble in organic solvents**
- ◆ **Less dense than water**
- ◆ **Melting & Boiling points**

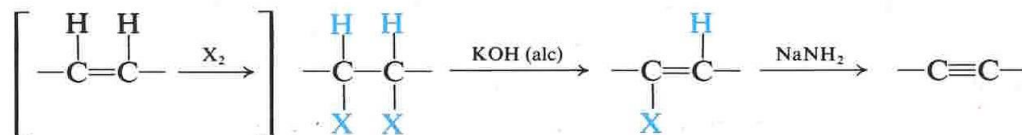
**Table 12.1 ALKYNES**

Name	Formula	M.p., °C	B.p., °C	Relative density (at 20 °C)
Acetylene	$\text{HC}\equiv\text{CH}$	-82	-75	
Propyne	$\text{HC}\equiv\text{CCH}_3$	-101.5	-23	
1-Butyne	$\text{HC}\equiv\text{CCH}_2\text{CH}_3$	-122	9	
1-Pentyne	$\text{HC}\equiv\text{C}(\text{CH}_2)_2\text{CH}_3$	-98	40	0.695
1-Hexyne	$\text{HC}\equiv\text{C}(\text{CH}_2)_3\text{CH}_3$	-124	72	0.719
1-Heptyne	$\text{HC}\equiv\text{C}(\text{CH}_2)_4\text{CH}_3$	-80	100	0.733
1-Octyne	$\text{HC}\equiv\text{C}(\text{CH}_2)_5\text{CH}_3$	-70	126	0.747
1-Nonyne	$\text{HC}\equiv\text{C}(\text{CH}_2)_6\text{CH}_3$	-65	151	0.763
1-Decyne	$\text{HC}\equiv\text{C}(\text{CH}_2)_7\text{CH}_3$	-36	182	0.770
2-Butyne	$\text{CH}_3\text{C}\equiv\text{CCH}_3$	-24	27	0.694
2-Pentyne	$\text{CH}_3\text{C}\equiv\text{CCH}_2\text{CH}_3$	-101	55	0.714
3-Methyl-1-butyne	$\text{HC}\equiv\text{CCH}(\text{CH}_3)_2$		29	0.665
2-Hexyne	$\text{CH}_3\text{C}\equiv\text{C}(\text{CH}_2)_2\text{CH}_3$	-92	84	0.730
3-Hexyne	$\text{CH}_3\text{CH}_2\text{C}\equiv\text{CCH}_2\text{CH}_3$	-51	81	0.725
3,3-Dimethyl-1-butyne	$\text{HC}\equiv\text{CC}(\text{CH}_3)_3$	-81	38	0.669
4-Octyne	$\text{CH}_3(\text{CH}_2)_2\text{C}\equiv\text{C}(\text{CH}_2)_2\text{CH}_3$		131	0.748
5-Decyne	$\text{CH}_3(\text{CH}_2)_3\text{C}\equiv\text{C}(\text{CH}_2)_3\text{CH}_3$		175	0.769

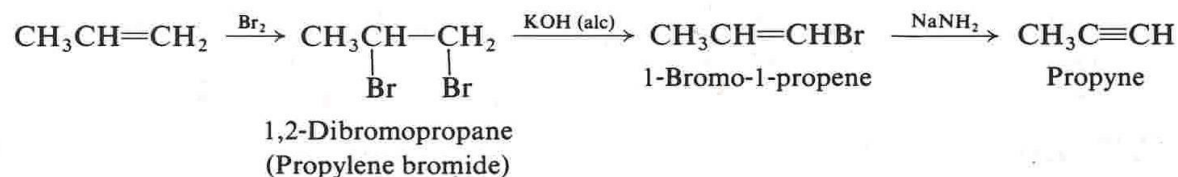
# PREPARATION OF ALKYNES

## PREPARATION OF ALKYNES

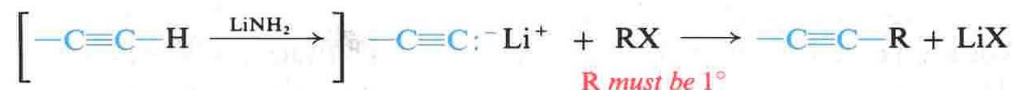
### 1. Dehydrohalogenation of alkyl dihalides. Discussed in Sec. 12.6.



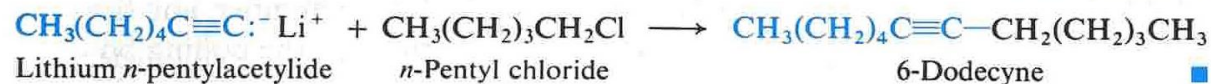
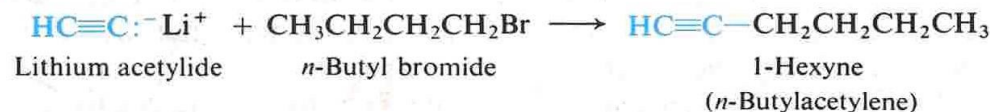
#### Example:



### 2. Reaction of metal acetylides with primary alkyl halides. Discussed in Sec. 12.12.

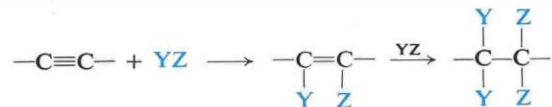


#### Examples:

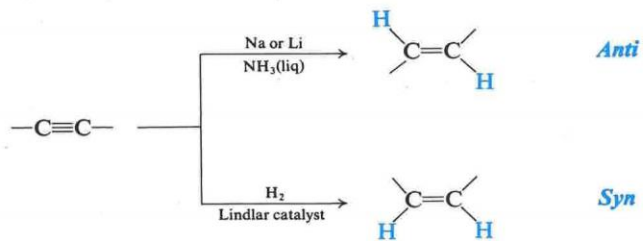
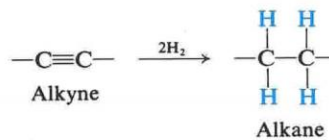


# REACTIONS OF ALKYNES

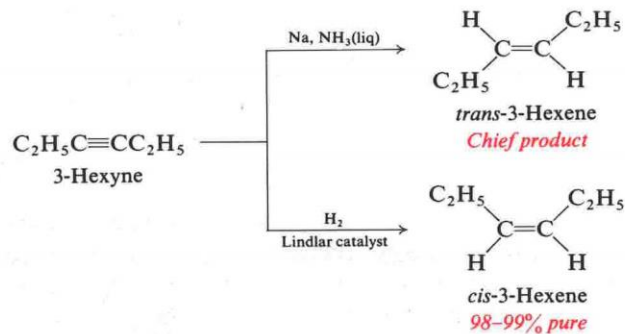
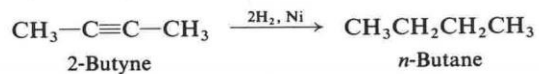
## Addition Reactions



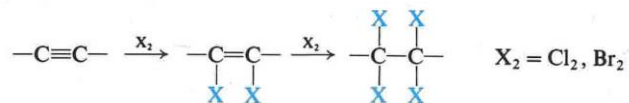
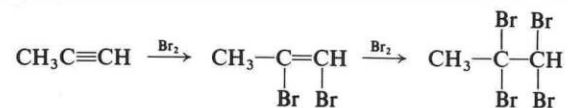
1. Addition of hydrogen. Discussed in Sec. 12.8.



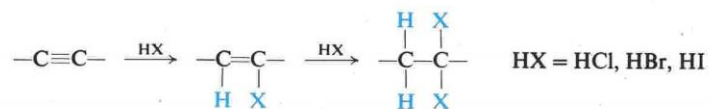
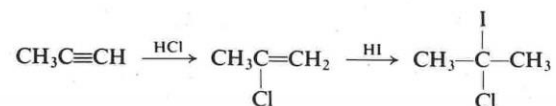
*Examples:*



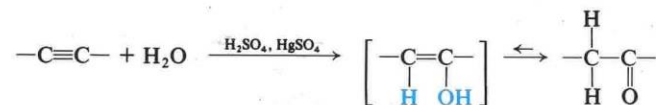
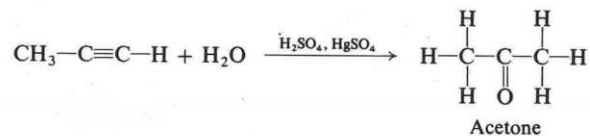
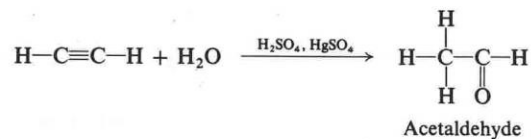
## 2. Addition of halogens. Discussed in Sec. 12.9.

*Example:*

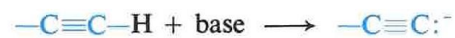
## 3. Addition of hydrogen halides. Discussed in Sec. 12.9.

*Example:*

## 4. Addition of water. Hydration. Discussed in Sec. 12.10.

*Examples:*

## Reactions as Acids



## 5. Formation of metal acetylides. Discussed in Sec. 12.11.

*Examples:*