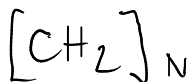
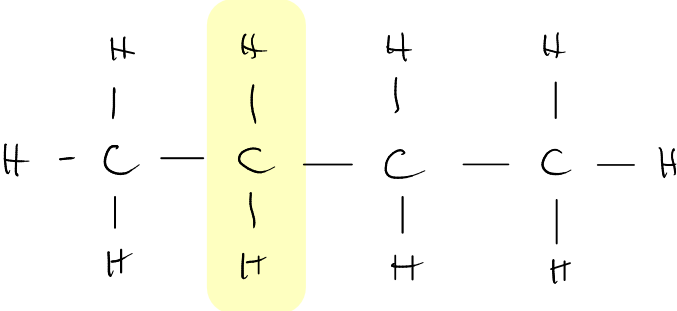
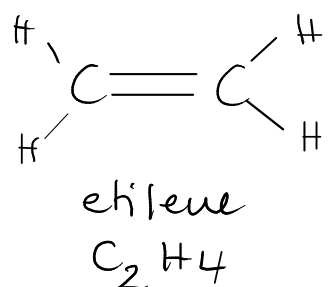


# POLIMERI

Macromolecola composta da unità molecolari ("monomeri") connessi in forma di catena.

## 1) Polietilene (PE)

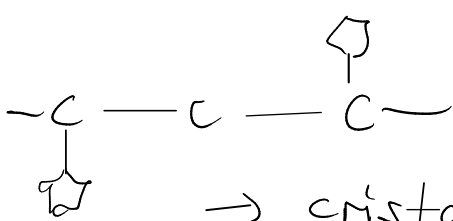


$N$ : grado di polimerizzazione

$M = mN$ : massa molecolare

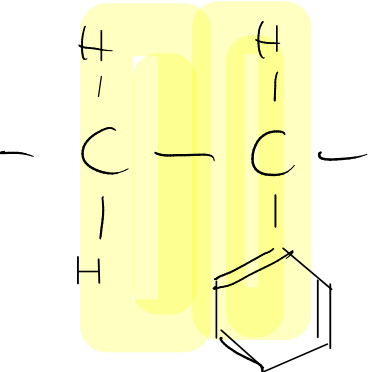
$N \sim 10 - 10^5$

## 2) Polistirene (PS)

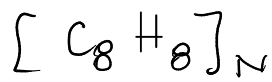


→ cristallizza  
→ vetrificazione

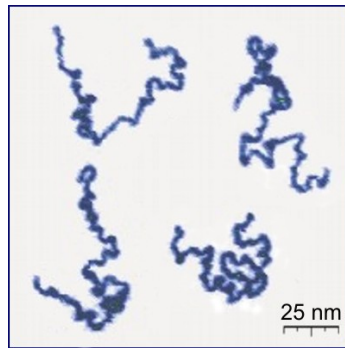
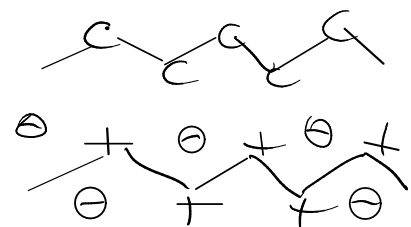
↓  
flessibile



Benzene  
 $\text{C}_6\text{H}_5$



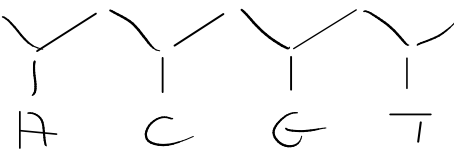
## 3) Polielettroliti



↑ 100 nm

Roiter, Miuko  
J. Am. Chem. Soc. '05

## 4) DNA



↓  
semi-flessibile

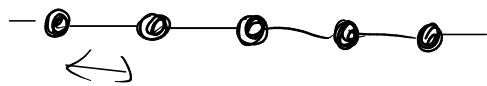
## Legami

~ chimici :  $\epsilon \gg k_B T_a$

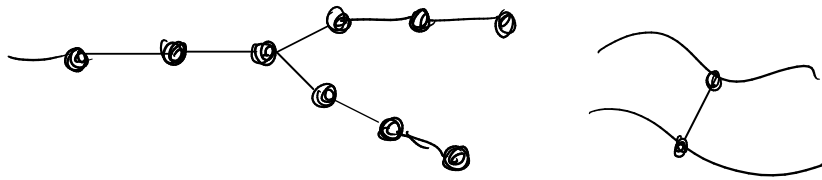
- fisici :  $\epsilon \sim k_B T_a \rightarrow$  biopolimeri

## Architettura

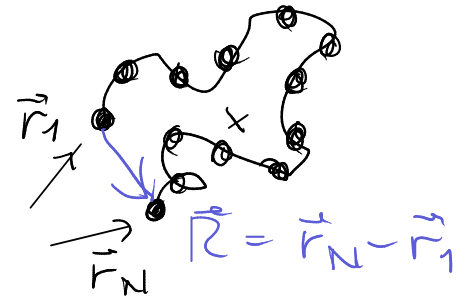
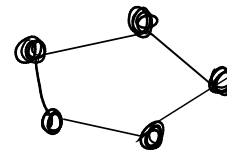
- lineari



- ramificati



- anello



## Estensione

Distanza tra monomeri :  $a \sim 10^{-10} \text{ m}$

Lunghezza totale :  $L = aN \sim 10^{-9} \text{ m} - 10^{-5} \text{ m} \approx 10 \mu\text{m}$

Vettore end-to-end :  $\vec{R} = \vec{r}_N - \vec{r}_1$

Distanza end-to-end :  $|\vec{R}| = |\vec{r}_N - \vec{r}_1|$

Conformazione :  $\{\vec{r}_1, \dots, \vec{r}_N\} \rightarrow \langle \dots \rangle \rightarrow \langle |\vec{R}|^2 \rangle$

Raggio di girazione :  $R_g = \sqrt{\langle \sum_{i=1}^N |\vec{r}_i - \vec{R}_{cm}|^2 \rangle} \cdot \frac{1}{N}$  ;  $R_g^2 = \langle \frac{1}{2N^2} \sum_{i=1}^N \sum_{j=1}^N |\vec{r}_i - \vec{r}_j|^2 \rangle$  (es.)

$$|(\vec{r}_i - \vec{R}_{cm}) - (\vec{r}_j - \vec{R}_{cm})|^2$$
$$\vec{R}_{cm} = \frac{1}{N} \sum_{i=1}^N \vec{r}_i$$