Mechanism :→ Copolymers

This type of polymerisation reaction also involves an initiator. which may be a free radical, a cation or anion.

* The addition polymerisation reaction is very rapid and is also characterized by three steps.
  (i) Chain initiation
  (ii) Chain Propagation
  (iii) Chain termination.

(1) Chain initiation :→

(a) Initiator ⟶ I*
Reactive species (free radical, cation or anion)

(b) I* + M (Monomer) ⟶ IM*

(2) Chain Propagation :→

(c) IM* + M → IMM*
Bigger reactive species

(d) IMM* + M → IMMM*
The propagation continues and results in growth of the chain forming polymer.
IMMM* + M, etc ⟶ I(M)nM
Polymer

Finally, the chain gets terminated when the active end reacts with a species which gives a molecule which is not an active species.

(3) Chain termination

$$I(M)_n M^* + T \longrightarrow I(M)_n MT$$

Many vinyl polymers are formed by chain reaction polymerisation in which the active species that initiates the reaction is a free radical and the chain grows by the successive addition of monomer to a free radical at the end of the chain.
The active end may also be a cation or an anion or a coordination complex.

$$H_2C=\underset{Cl}{CH} \xrightarrow{\text{Initiator}} -CH_2-\underset{Cl}{CH}-CH_2-\underset{Cl}{CH}-CH_2-\underset{Cl}{CH}-$$

or

$$\left(CH_2-\underset{Cl}{CH}\right)_n$$

Vinyl chloride

PVC
Polyvinyl chloride

$$H_2C-\underset{CN}{CH} \xrightarrow{\text{Initiator}} -CH_2-\underset{CN}{CH}-CH_2-\underset{CN}{CH}-CH_2-\underset{CN}{CH}-$$

or

$$\left(CH_2-\underset{CN}{CH}\right)_n$$

Vinyl cyanide
(Acrylonitrile)

(PAN) / Polyacrylonitrile / (orlon)

Date :

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$CH_2 = CH(C_6H_5)$ —Initiator→ $-CH_2-CH(C_6H_5)-CH_2-CH(C_6H_5)-CH_2-CH(C_6H_5)-$

Styrene

or

$$\left(CH_2-CH(C_6H_5)\right)_n$$

Polystyrene