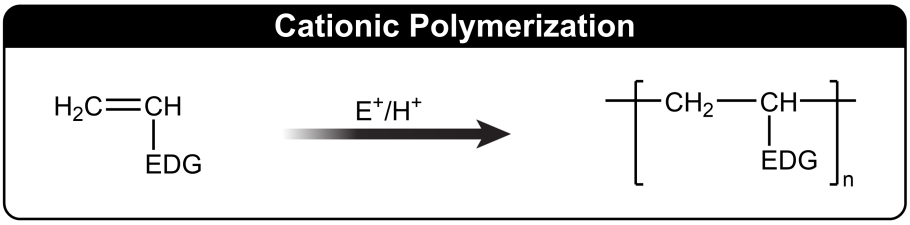
CONCEPT: CATIONIC POLYMERIZATION

- Alkenes with electron-_____ groups undergo cationic polymerization.
  - □ An _____ or ____ ion initiates the reaction.
    - The electrophile can be a Lewis acid such as _____.



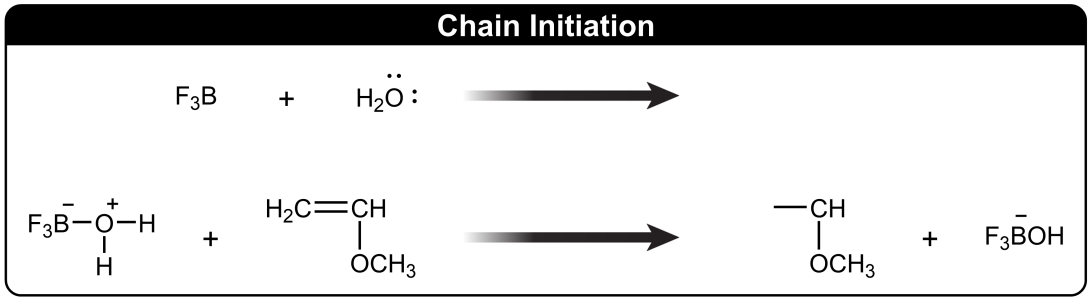
Cationic Polymerization Mechanism

- The reaction mechanism has 3 steps.

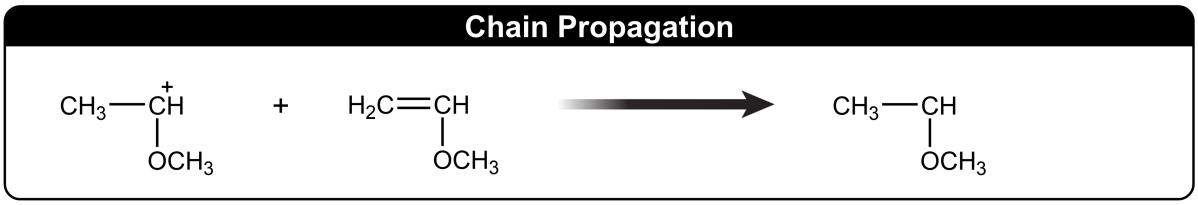
Step 1 Initiation | **Step 2** Propagation | **Step 3** Termination

STEP 1: The Lewis acid (BF_3) reacts with H_2O to form an adduct.

- □ The H_2O–BF_3 adduct donates a ____ ion to the monomer.



STEP 2: The monomer cation reacts with a monomer molecule and forms a new cation through head-to-tail addition.

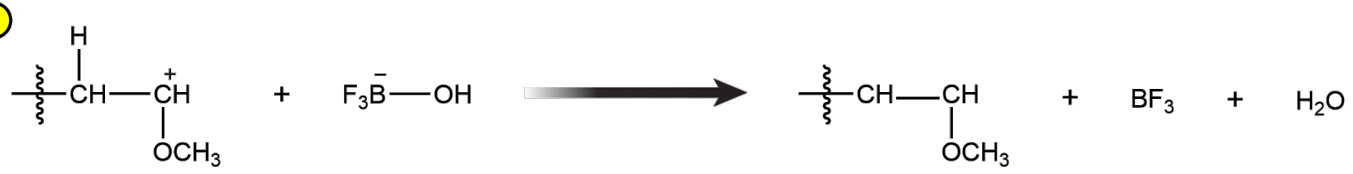


CONCEPT: CATIONIC POLYMERIZATION

STEP 3: Chain termination can occur by:

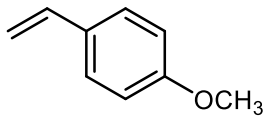
1. **Removal of H^+:** Loss of H^+ similar to _____.
2. **Nucleophilic Attack:** counterion from the initiation step can attack the cation.

Chain Termination

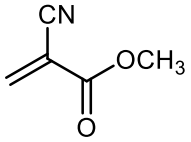
1. 

2. 

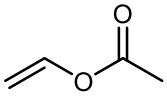
EXAMPLE: Arrange the following monomers from the highest to the lowest reactivity towards cationic polymerization.

I 

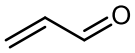
1-methoxy-4-vinylbenzene

II 

methyl 2-cyanoacrylate

III 

vinyl acetate

IV 

acrylaldehyde

PRACTICE: Many heterocyclic compounds can undergo polymerization under acidic conditions. Draw the mechanism of the propagation step for cationic polymerization of thietane (four-membered saturated sulfur heterocycle).