

9.6.2 Alkylation and Acylation of Amines

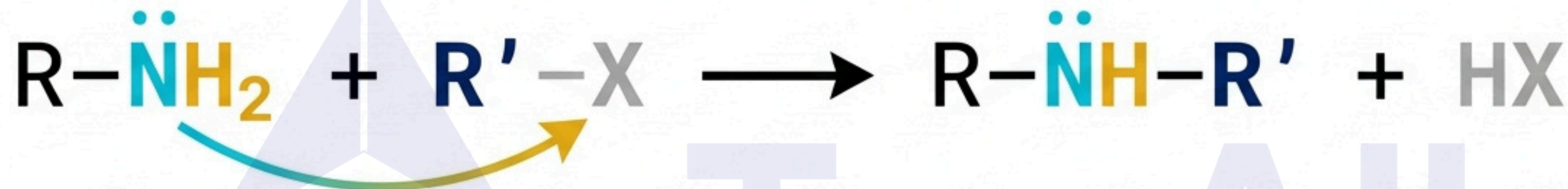


1° Amine

2° Amine

3° Amine

Alkylation: Building Carbon Chains



The Nucleophile

Amines use their unshared electron pair to attack the carbon-halogen bond.

Chain Growth

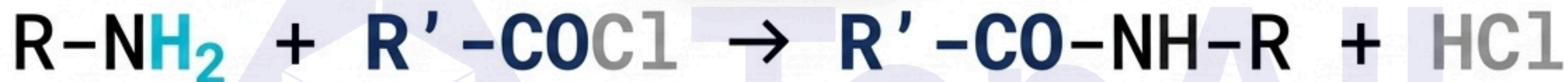
The reaction replaces amine hydrogens with alkyl groups, converting 1° amines to 2°, then 3°, and eventually forming **quaternary ammonium salts**.

Halide Reactivity: $\text{R-I} > \text{R-Br} > \text{R-Cl}$

NUCLEOPHILIC ACYL SUBSTITUTION

Acylation with Acid Chlorides

Pyridine



The Role of Pyridine

Pyridine acts as a base stronger than the amine itself. It neutralizes the HCl byproduct formed during the reaction, which actively shifts the chemical equilibrium to the right side (products).



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Acylation with Anhydrides and Esters

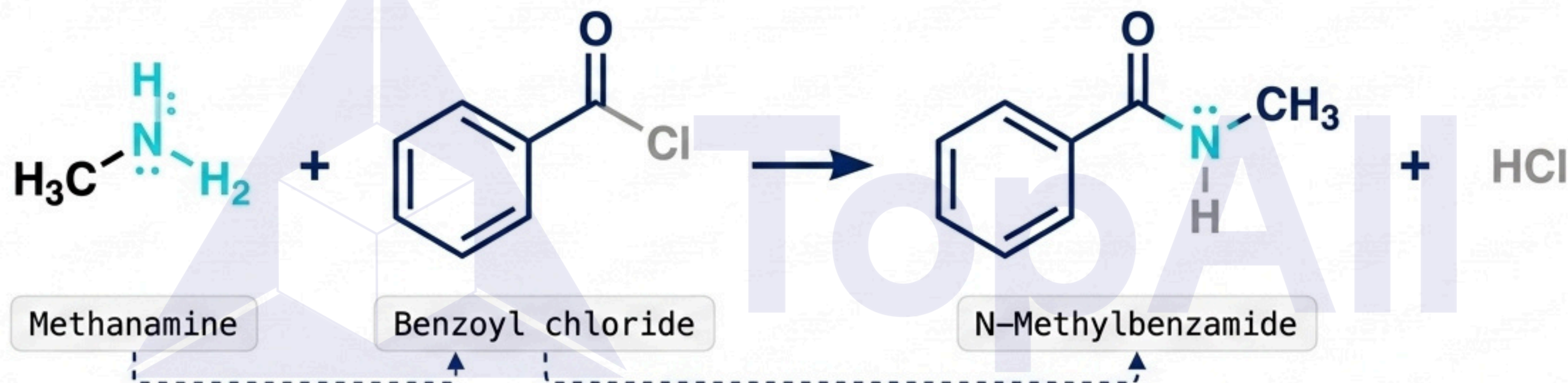
Anhydride**Ester**

Same Transfer, Different Leaving Group

The underlying transformation is identical to acid chlorides. The amine replaces a hydrogen atom with an acyl group. Only the byproduct changes based on the starting electrophile.

NAMED REACTION VARIANT

Benzoylation



Aromatic Acylation

When the transferred acyl group includes a benzene ring directly attached to the carbonyl carbon, the specific acylation process is termed Benzoylation.

Final Comparison: Alkylation vs. Acylation

	ALKYLATION	ACYLATION
Product Formed	Substituted Amines (2°, 3°, Quaternary)	Amides
Reagent Type	Alkyl Halides (R-X)	Acyl Halides, Anhydrides, Esters
Reaction Environment	No added base required	Requires stronger base (e.g., Pyridine)
Reacts with 3° Amines?	Yes (Forms quaternary salts)	No (3° amines lack a replaceable hydrogen)

Recap Chip

**Master Rule: Alkylation continuously builds substituted amine chains.
Acylation neutralizes the amine to form an amide.**



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