Direct Addition vs Conjugate Addition

The Nature of the Nucleophile

Attribute	Direct Addition	Conjugate Addition
Base strength of nucleophile	Nucleophiles that are stronger bases	Nucleophiles that are weaker bases
Carbanion nucleophiles	Organolithium (RLi) and Grignard reagents (RMgBr)	**Organocopper reagents (R_2CuLi)** **Cyanide (NaCN)** **Enolates**
Hetero nucleophiles	Amines (RNH_2)	Thiols (RSH)
Hydride Nucleophiles	Lithium aluminium hydride ($LiAlH_4$)	Copper hydride (CuH)

Conjugate Addition Reactions

Reactions with Enolates: The Rationale

Enolate nucleophiles can undergo conjugate addition, but they have exactly the same opportunity to attack the carbonyl group directly as do simple nucleophiles.

Thermodynamic control leads to conjugate addition, but kinetic control leads to direct attack.

Success in conjugate addition is pegged on the direct addition (an Aldol reaction) being reversible. This enables the conjugate addition to compete and, as its product is more stable (thermodynamically stable), it eventually become the sole product.