The direct conversion of a carboxylic acid to an amide is difficult because amines are basic and tend to convert carboxylic acids to their highly unreactive carboxylates. In this reaction the carboxylic acid adds to the DCC molecule to form a good leaving group which can then be displaced by an amine during nucleophilic substitution. DCC induced coupling to form an amide linkage is an important reaction in the synthesis of peptides.

**Dicyclohexylcarbodiimide (DCC)**

**Basic reaction**

![Basic reaction diagram](image)

**Going from reactants to products simplified**

1) Deprotonation

![Mechanism diagram](image)
2) Nucleophilic attack by the carboxylate

3) Nucleophilic attack by the amine

4) Proton transfer

5) Leaving group removal

**Contributors**

- Prof. Steven Farmer ([Sonoma State University](https://www.sonoma.edu))