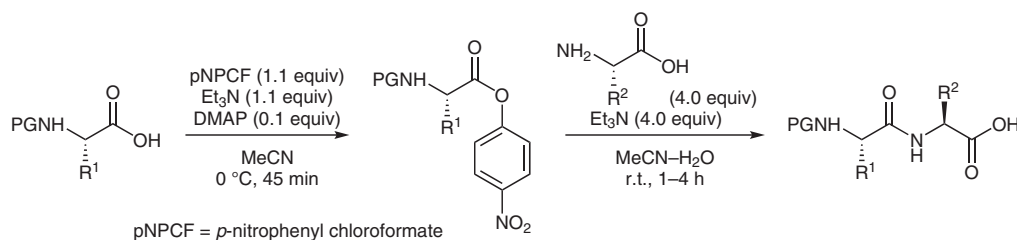


Peptide Bond Formation by Using *p*-Nitrophenyl Esters



Product	Isolated yield / %	Product	Isolated yield / %
Cbz-Phe-Cys-OH	98 ^a	Cbz-Phe-Phe-Val-OH	66 ^{a,b}
Cbz-Phe-His-OH	88 ^a	Boc-Gln-Gly-OH	35 ^c
Cbz-Phe-Ser-OH	67 ^a	Cbz-Gln-Gly-OH	65 ^c
Fmoc-Phe-Phe-OH	82 ^a	Cbz-Gln-Ser-OH	31 ^c
Cbz-Gln-Ala-OH	66 ^a	Cbz-Gln-Gly-Gly-OH	30 ^{b,c}
Cbz-Gln-Leu-OH	70 ^a	Cbz-Gly-Gln-Gly-OH	15 ^{b,c}
Cbz-Gln-Phe-OH	79 ^a	Cbz-Gln-Leu-OH	71 ^c
Cbz-Gln-Val-OH	44 ^a	Cbz-Gly-Leu-Gly-OH	43 ^{b,c}

^a Purified by precipitation. ^b Overall yield for two coupling steps. ^c Purified by chromatography.

Significance: Reactive amino acid phenyl esters have been used in peptide synthesis. In 2002, Keillor and co-workers reported a method for peptide bond formation between *p*-nitrophenyl esters and unprotected amino acids in aqueous solution.

Comment: By using *p*-nitrophenyl esters formed in situ, various dipeptides or tripeptides were synthesized without classical peptide-coupling reagents. The yields of the target peptides were moderate to excellent.