Selenium in Peptide Chemistry

Autorzy

Özge Pehlivan

Mateusz Waliczek

Monika Kijewska

Piotr Stefanowicz

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In recent years, researchers have been exploring the potential of incorporating selenium into peptides, as this element possesses unique properties that can enhance the reactivity of these compounds. Selenium is a non-metallic element that has a similar electronic configuration to sulfur. However, due to its larger atomic size and lower electronegativity, it is more nucleophilic than sulfur. This property makes selenium more reactive toward electrophiles. One of the most significant differences between selenium and sulfur is the dissociation of the Se-H bond. The Se-H bond is more easily dissociated than the S-H bond, leading to higher acidity of selenocysteine (Sec) compared to cysteine (Cys). This difference in acidity can be exploited to selectively modify the reactivity of peptides containing Sec. Furthermore, Se-H bonds in selenium-containing peptides are more susceptible to oxidation than their sulfur analogs. This property can be used to selectively modify the peptides by introducing new functional groups, such as disulfide bonds, which are important for protein folding and stability. These unique properties of selenium-containing peptides have found numerous applications in the field of chemical biology. For instance, selenium-containing peptides have been used in native chemical ligation (NCL). In addition, the reactivity of Sec can be harnessed to create cyclic and stapled peptides. Other chemical modifications, such as oxidation, reduction, and photochemical reactions, have also been applied to selenium-containing peptides to create novel molecules with unique biological properties.

Słowa kluczowe

selenium, native chemical ligation, stapled peptides, photochemical reactions

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