

Amino acid silyl esters as an efficient precursor in the 1,3-dipolar cycloaddition of azomethine ylides to fullerene C₆₀

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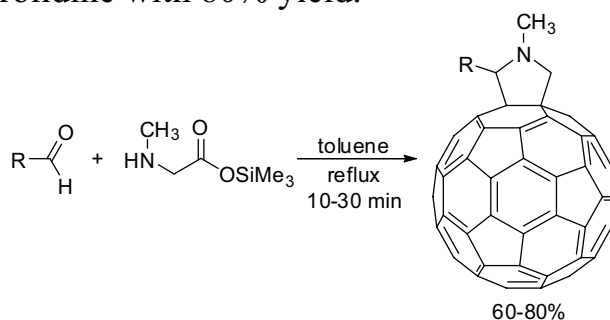
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The most routine method for fullerenes functionalization is the Prato reaction, which leads to fulleropyrrolidines with a quite good yield (30–40%). This method is based on the 1,3-dipolar cycloaddition of azomethine ylides, generated *in situ* thermally from aldehydes or ketones and amino acids, to the fullerene. Accordingly, a broad acceptance of the Prato reaction is explained by accessibility of a wide range of various amino acids and carbonyl compounds.

The classic conditions of the Prato reaction involve reflux of *N*-methylglycine (sarcosine) and paraformaldehyde in toluene during 2 h, affording *N*-methylfulleropyrrolidine with 41% yield [1]. In the case of less reactive amino acids and carbonyl compounds used, reaction may require a prolonged reflux and gives a final product in a low yield [2].

Here we report utilization of amino acid silyl esters as an efficient precursor for generation of azomethine ylides in the 1,3-dipolar cycloaddition to fullerene C₆₀. Thus, reflux of *N*-methylglycine trimethylsilyl ester and paraformaldehyde in toluene during 10 min leads to formation of *N*-methylfulleropyrrolidine with 80% yield.



Starting from various amino acids silyl esters and carbonyl compounds, a series of substituted fulleropyrrolidines were synthesized with comparatively high yield (60–80%).

[1] M. Maggini, G. Scorrano, M. Prato, *J. Am. Chem. Soc.*, **115**, 9798 (1993).

[2] B. M. Illescas, N. Martin, *J. Org. Chem.*, **70**, 6929 (2005).