Autooxidative Annulation of the α-Cyano β-TMS-capped Alkynyl Cycloalkanone System. Discovery of A Novel Synthetic Reaction in Organic Chemistry

Ying-Chieh Wong¹ (翁英傑), Min-Tsang Hsieh¹, Prashanth K. Amancha¹, Chih-Lung Chin², Cheng-Feng Liao², Chun-Wei Kuo¹, and Kak-Shan Shia¹* (夏克山)

¹ Institute of Biotechnology and Pharmaceutical Research, National Health Research Institutes, Miaoli, Taiwan
² Material and Chemical Research Laboratories, Industrial Technology Research Institute, Hsinchu, Taiwan

During the course of our studies on α-activated cross conjugated cycloalkenone systems in organic synthesis, we have serendipitously discovered that compound 2, obtained through 1,4-conjugate addition of 1-(trimethylsilyl)-1-butyn-4-yl magnesium chloride to α-cyano cyclohexenone 1, could undergo autooxidative annulation upon exposure to air and light to afford cyclic products 3 and 4, respectively (Figure 1).

![Chemical structures](image)

**Figure 1**

To optimize reaction conditions, reaction parameters, including solvents, bases and time, were systematically varied and monitored. As a result, the system (pyridine (catalyst)/O₂ (1 atm)/rt) is found to be the method of choice to effect the observed autooxidative reaction. On the basis of this newly developed protocol, a variety of highly functionalized bicyclic frameworks can be effectively constructed in moderate to good yields as illustrated in Scheme 1.

![Scheme 1](image)