

# 秋水仙素與甲硫秋水仙素光化學反應的研究

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## 摘要

本論文研究秋水仙素與甲硫秋水仙素的光化學反應性質。秋水仙素(1)與甲硫秋水仙素(5)的差異，為化學結構上之環庚三烯酚酮(tropolone)的羥基(-OH)分別被甲氧基(-OCH<sub>3</sub>)及甲硫基(-SCH<sub>3</sub>)取代，因其結構相近使得物理與化學性質相似，為一種有效治療痛風之藥物。然而，其結構上環庚三烯酮(tropone)的構造很容易因照光而進行環合反應，使得藥物耐光性較差而容易變質。秋水仙素(1)照光得到 $\beta$ -lumicolchicine(2)、 $\gamma$ -lumicolchicine(3)，將 $\beta$ -lumicolchicine(2)繼續照光，可以得到 $\alpha$ -lumicolchicine(4)。甲硫秋水仙素(5)照光得到 $\beta$ -lumithiocolchicine(6)、 $\gamma$ -lumithiocolchicine(7)。秋水仙素(1)與甲硫秋水仙素(5)二者在化學動力學的研究，測量其在不同溶劑極性下及不同照光時間下之產物 $\beta/\gamma$ 比值，並比較其光化學反應速率，結果顯示化合物(1)與化合物(5)皆進行Woodward-Hoffmann的電環反應，化合物(1)因其環庚三烯酮(tropone)環上甲氧基(-OCH<sub>3</sub>)有較高的光化學反應性及產物立體選擇性；化合物(5)則因甲硫基(-SCH<sub>3</sub>)有較低的反應性及立體選擇性。

關鍵字：秋水仙素、環合反應、立體選擇性

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# The study of the photochemical reaction of colchicine and thiocolchicine

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## Abstract

The photochemical reactions of colchicine and thiocolchicine were studied in this thesis. The difference of structure between colchicine(1) and thiocolchicine(5) is that hydroxyl functional group(-OH) on the tropolone ring is substituted, one is methoxyl functional group(-OCH<sub>3</sub>), and the other is methylthio functional group(-SCH<sub>3</sub>). Because of their similar structure make the physical and chemical properties similarly, and both they are effective treatment for gout drugs. However, the poor resistance to UV light of the tropone which is easily photocyclized by irradiation makes them easy to perish. Irradiation of colchicine(1) gives mainly two photoproducts:  $\beta$ -lumicolchicine(2) and  $\gamma$ -lumicolchicine(3). Further irradiation of  $\beta$ -lumicolchicine(2) gives the photoproduct of  $\alpha$ -lumicolchicine(4). Irradiation of thiocolchicine(5) gives  $\beta$ -lumithiocolchicine(6) and  $\gamma$ -lumithiocolchicine(7). The chemical kinetic of colchicine(1) and thiocolchicine(5) is studied and the ratios ( $\beta/\gamma$ ) of photoproducts is analyzed under different polar solvents and irradiative times. The results show that both colchicine(1) and thiocolchicine(5) favor the Woodward-Hoffmann electrocyclic reaction. Colchicine(1) has higher photochemical reactivity and higher product stereoselectivity with the methoxyl functional group(-OCH<sub>3</sub>) of tropone. Thiocolchicine(5) with the methylthio functional group(-SCH<sub>3</sub>) of tropone has lower photochemical reactivity and lower product stereoselectivity.

Keywords : colchicine, cyclization, stereoselectivity