

Syntheses of Complex Securinega Alkaloids and Beyond

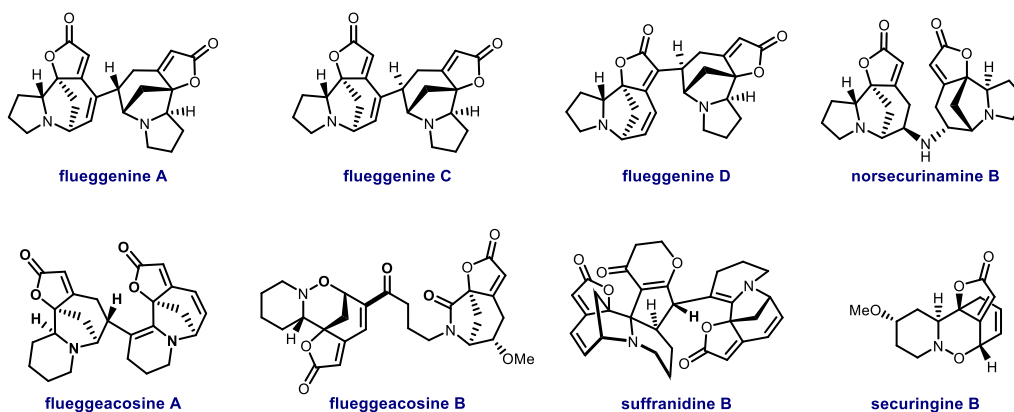
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Securinega alkaloids have captivated the chemical community for more than six decades. Within this family of secondary metabolites, several members arise through oligomerization and (or) oxidation of the basic tetracyclic securinega monomer. Although the synthesis of monomeric securinega alkaloids has been extensively studied, access to their oligomeric and oxidized congeners had remained challenging. This gap was due to the absence of suitable synthetic technologies capable of addressing the added structural complexity of these higher-order and oxidized and rearranged derivatives.

In this presentation, our group's recent discoveries centered on the chemical synthesis of high-order and high-oxidation state securinega alkaloids will be discussed.¹ Total synthesis of Rauhut–Currier reaction-based dimeric securinega such as flueggeines A,² C,³ and D⁴ will be discussed. The synthesis of NH-linked dimer norsecurinamine B will be discussed.⁵ Collective total synthesis of C4-oxygenated securinine-type alkaloids⁶ and concise synthesis of dimeric securinega alkaloid flueggeacosine B⁷ and suffranidine B⁸ will be discussed. The development of securinega B-inspired molecular photoswitch will also be described.⁹



1. Kang, G.; Park, S. Han, S.* "Synthesis of High-Order and High-Oxidation State Securinega Alkaloids" *Acc. Chem. Res.* **2023**, *56*, 140.
2. Seo, S. M.; Kim, D.; Kim, T.; Han, S.* "Total Synthesis of (–)-Flueggeine A and (–)-15-*epi*-Flueggeine D" *Chem. Sci.* **2025**, *16*, 1216.
3. Jeon, S.; Han, S.* "An Accelerated Intermolecular Rauhut–Currier Reaction Enables the Total Synthesis of (–)-Flueggeine C." *J. Am. Chem. Soc.* **2017**, *139*, 6302.
4. Jeon, S.; Lee, J.; Park, S.; Han, S.* "Total Synthesis of Dimeric Securinega Alkaloids (–)-Flueggeines D and I" *Chem. Sci.* **2020**, *11*, 10928.
5. Shin, M.; Seo, S.; Han, S. *submitted*.
6. Park, S.; Kang, G.; Kim, C.; Kim, D.; Han, S.* "Collective Total Synthesis of C4-Oxygenated Securinine-Type Alkaloids via Stereocontrolled Diversifications on the Piperidine Core" *Nature Commun.* **2022**, *13*, 5149.
7. Kang, G.; Han, S.* "Synthesis of Dimeric Securinega Alkaloid Flueggeacosine B: From Pd-Catalyzed Cross-Coupling to Cu-Catalyzed Cross-Dehydrogenative Coupling" *J. Am. Chem. Soc.* **2022**, *144*, 8932.
8. Kang, G.; Han, S.* "Synthesis of Suffranidine B" *J. Am. Chem. Soc.* **2023**, *145*, 24493.
9. Park, S.; Kang, G.; Kim, W.; Jeon, S.; Chung, M. K.; Lee, H.-S.; Yoon, D. K.* Han, S.* "Synthesis of Securinega B Enables Photoresponsive Materials Design" *Chem* **2025**, *11*, 102336.