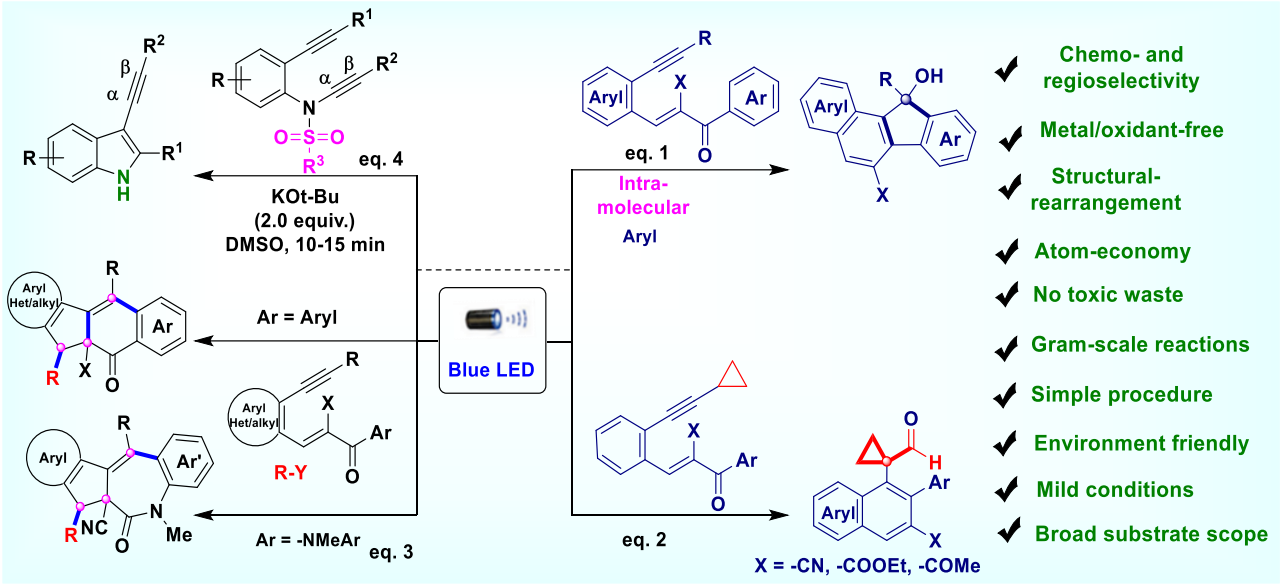
王志鉦 教授

生命科學院/醫藥暨應用化學系

多環芳香烴（PAHs）和雜環化合物，由於其獨特的性質，在化學和材料科學領域的合成效率在過去幾十年中顯著提高。基於此背景，我們開發了一種高效方法，用於合成取代的芴醇及廣受重視的環丙基融合醛類。這些化合物通過可見光促進的分子內途徑構建，經由光氧化還原催化處理後，實現 100%的原子經濟性和卓越的可擴展性，成功合成了目標區域多樣化的產物（圖 1，eqs. 1 和 2，*Green Chemistry*, 2024, *26*, 513-519）[1]。我們還報導了一種自由基串聯雙環化策略，通過多種自由基前體，在錳（豐富的地球金屬）-銥光氧化還原催化下，對共軛內部 1,5-enynes 進行轉化，構建了取代的 fluorenones 和 azepinones 骨架（圖 1，eqs. 3）[2]。此外，我們開發了一種以鹼為促進劑的區域選擇性和化學選擇性的級聯環化策略，實現了炔胺 N－Csp 鍵斷裂、選擇性分子內 1,3-migration 和同時的 *N*-desulfonylation 策略，在 15 分鐘內高效合成了 2-phenyl-3-(phenylethynyl)-1*H*-indole 衍生物（圖 1，eqs. 4）[3]。上述所有反應均在溫和的反應條件下進行，通過簡單的藍光 LED 反應裝置，在室溫下實現複雜的分子內串聯轉化，並具有 100%的原子經濟性，符合各項綠色化學指標，易於大量生產且無副產物生成。我們正和校內老師合作，篩選這些雜環化合物對癌細胞株的生物活性。希望在藥物設計與合成上對高醫有所幫助。



Reference:

1. Babasaheb Sopan Gore, Lin-Wei Pan, Jun-Hao Lin, Yi-Chi Luo and **Jeh-Jeng Wang***, "Visible light-driven highly atom-economical divergent synthesis of substituted fluorenols and cyclopropylcarbaldehydes", *Green Chem.* **2024**, *26*, 513-519.
2. Babasaheb Sopan Gore, Chun-Cheng Chen, Ping-Yu Lin and **Jeh-Jeng Wang***, "Photochemical Radical Bicyclization of 1,5-Enynes: Divergent Synthesis of fluorenes and azepinones", *Org. Lett.* **2024**, *26*, 757-762.
3. Mohana Reddy Mutra, T. L. Chandana, Chung-Wei Chang and **Jeh-Jeng Wang***, "Base-Promoted Structural Rearrangement of Ynamide and Simultaneous *N*-Desulfonylation", *Adv. Syn. & Cat.* **2024**, *366*, 1615-1626.

【具體成果】

2024 年獲獎經歷

1. 指導博後莫哈納獲國科會 112-113 兩年度研究學者研究計畫。
2. 獲高雄醫學大學 2023 年，研究績優教師:"研究成果績優獎"(2023 Outstanding Research Award).
3. 獲高雄醫學大學 2023 年，研究績優教師:"優秀論文獎"(2023 Outstanding Research Award)。
4. 獲邀刊登論文簡介於國科會自然處《化學圖書服務計畫》2023 年 9 月號電子報。
5. 獲 2024 年國科會補助大專校院研究獎勵。
6. H-index: 38。i10-index: 103。

高被引論文(selected high cited papers)

1. J. K. Vandavasi, W. P. Hu, C. Y. Chen, and **Jeh-Jeng Wang***, "Efficient Synthesis of Unsymmetrical Disulfides", *Tetrahedron,* **2011**, *67*, 8895-8901. (Citation 151, IF: 2.1)

2. G. C. Senadi, W. P. Hu, J. S. Xiao, J. K. Vandavasi, C. Y. Chenc and **Jeh-Jeng Wang***, "Facile Selective and Regiocontrolled Synthesis of Oxazolines and Oxazoles Mediated by ZnI_2 and $FeCl_3$", *Org. Lett.* **2012**, *14*, 4478-4481. (Citation 130, IF: 4.9)

3. **Jeh-Jeng Wang***, Y. K. Shen, W. P. Hu, M. C. Hsieh, F. L. Lin, M. K. Hsu, M. H. Hsu "Design, synthesis, and Biological Evaluation of Pyrrolo[2,1-c][1,4]benzodiazepinene and Indole Conjugates as Anticancer Agents", *J. Med. Chem.* **2006**, *49*, 1442-1449. (Citation 104, IF: 6.8)

4. G. C. Senadi, W.-P. Hu, T.-Y. Lu, A. M. Garkhedkar, J. K. Vandavasi, and **Jeh-Jeng Wang***, "I_2-TBHP-Catalyzed Oxidative Cross-coupling of N-sulfonyl hydrazones and Isocyanides to 5-aminopyrazoles", *Org. Lett.* **2015**, *17*, 1521-1524. (Citation 105, IF: 4.9)

5. **Jeh-Jeng Wang*,** "Novel Pyrrolo[2,1-*c*][1,4]benzodiazepine-Indole Derivatives, and Preparation Process and Uses of the Same", U. S. A. patent. 6939869B2 (**2005-2025**). (Citation 94)

6. C. Y. Chen, W. P. Hu, P. C. Yan, G. C. Senadi, and **Jeh-Jeng Wang***, "Metal Free, Acid-Promoted Synthesis of Imidazole Derivatives via Multi-Component Reaction" *Org. Lett.* **2013**, *15*, 6116-6119. (Citation 89, IF: 4.9)

7. G. C. Senadi, B.-C. Guo, W.-P. Hu, and **Jeh-Jeng Wang***, "Iodine-promoted cyclization of N-propynyl amides and N-allyl amides via sulfonylation and sulfenylation", *ChemComm.* **2016**, *52*, 11410-11413. (Citation 87, IF: 4.3)

8. M. R. Mutra, V. S. Kudale, W.-H. Tsai and **Jeh-Jeng Wang***, "Alkene Versus Alkyne Reactivity in Unactivated 1,6-Enynes: Regio- and Chemoselective Radical Cyclization with Chalcogens under metal- and oxidant-free conditions" *Green Chem.* **2020**, *22*, 2288-2300. (Citation 83, IF: 9.3)

9. H. Y. Hsieh, W. C. Lee, G. C. Senadi, W. P. Hu*, J. J. Liang, T. R. Tsai, Y. W. Chou, K. K. Kou, C. Y. Chen, and **Jeh-Jeng Wang***, "Discovery, Synthetic Methodology and Biological Evaluation for Anti-Photoaging Activity of Bicyclic[1,2,3]Triazoles: In Vitro and in Vivo Studies", *J. Med. Chem.* **2013**, *56*, 5422-5435. (Citation 80, IF: 6.8)

10. M. R. Mutra, and **Jeh-Jeng Wang***, "Photoinduced ynamide structural reshuffling and functionalization", *Nature Comm.* **2022**, *13*, 2345. (Citation 29, IF: 14.7)

【研究團隊】

團隊成員：王志鉦教授、高伯賀博士後研究員(Dr. Gore)、莫哈納博士後研究員(Dr. Mohan)，以及兩位助理和 9 位學生。

團隊簡介：

高伯賀博士後研究員(Dr. Gore)和莫哈納博士後研究員(Dr. Mohan)，原先是我的博士班學生，畢業後繼續在我的實驗室研究已有十年左右，實驗技巧與專業知識非常豐富，為人客氣也非常願意教導後進，學生受益良多。

原先我們實驗室是利用傳統方法來研究藥物合成，有感於環保愛地球理念，過去的幾年，我們開始關注乾淨、可再生且資源豐富的綠色化學，例如在有機合成中應用的可見光為光源來照射反應。該技術能在溫和且環境友善的條件下，便利且高效地合成多種有價值的化合物，兩位博後在我實驗室已發表高點數論文 30 篇，貢獻良多。

研究聯繫 Email：

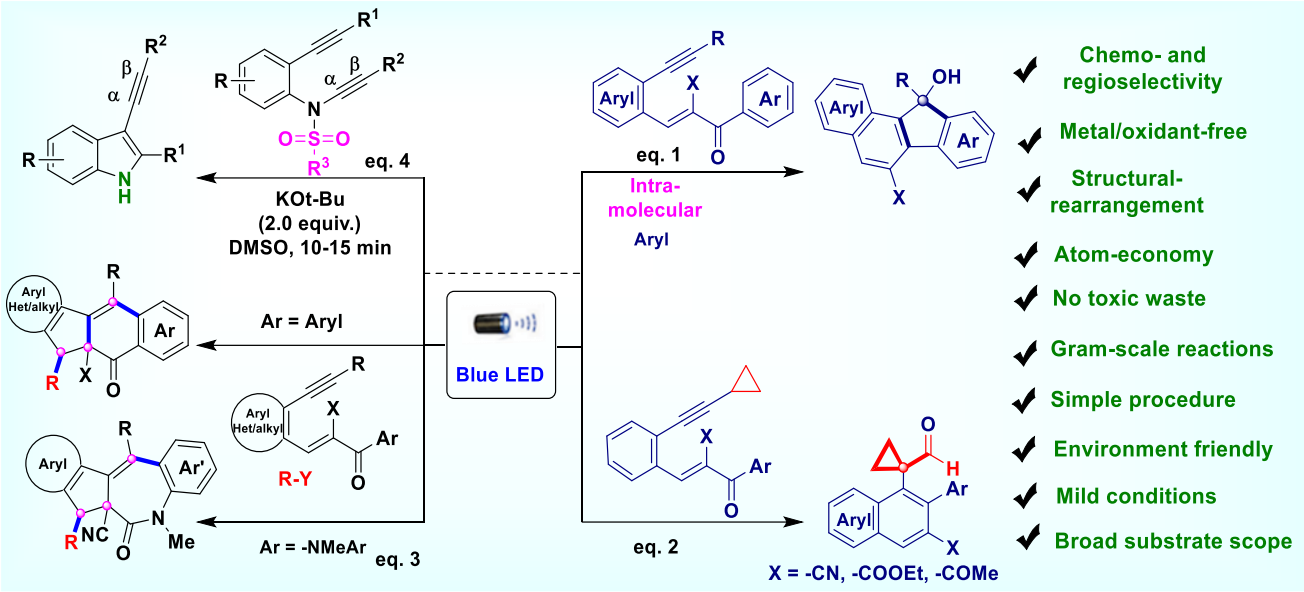
王志鉦教授:jjwang@kmu.edu.tw

高伯賀博士後:gorepranav99@gmail.com

莫哈納博士後:mohan.mohan2060@gmail.com

Chemical syntheses with polycyclic aromatic hydrocarbons (PAHs) and heterocyclic compounds have increased in efficiency in recent decades in the fields of chemistry and materials science due to their unique properties. Considering these facts, we have developed an efficient access for substituted fluorenols and widely privileged cyclopropyl-fused carbaldehydes have been constructed under visible-light intramolecular pathways. A readily available precursors were prepared from commercial sources and then exposed under photoredox catalysis, which gave 100% atom-efficiency and excellent scalability to the desired regio-divergent product (Figure 1, eqs. 1 and 2, *Green Chemistry*, **2024**, *26*, 513-519).[1] Similarly, we have also reported a radical tandem bicyclization strategy of conjugated internal 1,5-enynes to construct the

substituted fluorenones and azepinones frame-work with various radical precursors under dual nickel (an earth-abundant metal)-Ir photoredox catalysis (Figure 1, eqs. 3).[2] In addition, we also constructed a base-promoted regioselective and chemoselective cascade cyclization, ynamide *N*-Csp bond cleavage, selective intramolecular 1,3-migration, and simultaneous *N*-desulfonylation strategy for the synthesis of 2-phenyl-3-(phenylethynyl)-1*H*-indole derivatives within a time of 15 min (Figure 1, eq. 4).[3] The all above mentioned reaction is conducted under mild reaction conditions under a simple Blue light LED setup, complies with Green Chemistry Metrics, easy scale-up, and no by-product formation. Furthermore, we are cooperating KMU colleagues to screen the heterocyclic compounds on biological activities against cancer cell lines.



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【Concrete Results】

2024 Award Experience

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【Research Team】

王志鉦教授、高伯賀博士後研究員(Dr. Gore)、莫哈納博士後研究員(Dr. Mohan)，以及兩位助理和 9 位學生。

Research Team Introduction：

As a post-doctoral fellow and former doctoral student, Dr. Gore and Dr. Mohan are two of my closest colleagues and I share a lot of chemistry knowledge and have pleasant conversations with each other. In past few years onwards, we have also been paying attention to clean, renewable, and abundant energy sources such as visible light photocatalysis in organic synthesis, which can conveniently and efficiently produce a variety of valuable products under mild and environmentally benign conditions. Originally, our laboratory used traditional methods to study drug synthesis. We were inspired by the concept of environmental protection and caring for the earth. In the past few years, we began to pay attention to clean, renewable and resource-rich green chemistry, such as visible light as a light

source in organic synthesis. to illuminate the reaction. This technology can synthesize a variety of valuable compounds conveniently and efficiently under mild and environmentally friendly conditions. Two postdocs have published 30 high-resolution papers in my laboratory and have made many contributions.

Research Contacts Email：

Prof. Jeh-Jeng Wang:jjwang@kmu.edu.tw

Dr. Babasaheb Sopan Gore:gorepranav99@gmail.com

Dr. Mohana Reddy Mutra:mohan.mohan2060@gmail.com