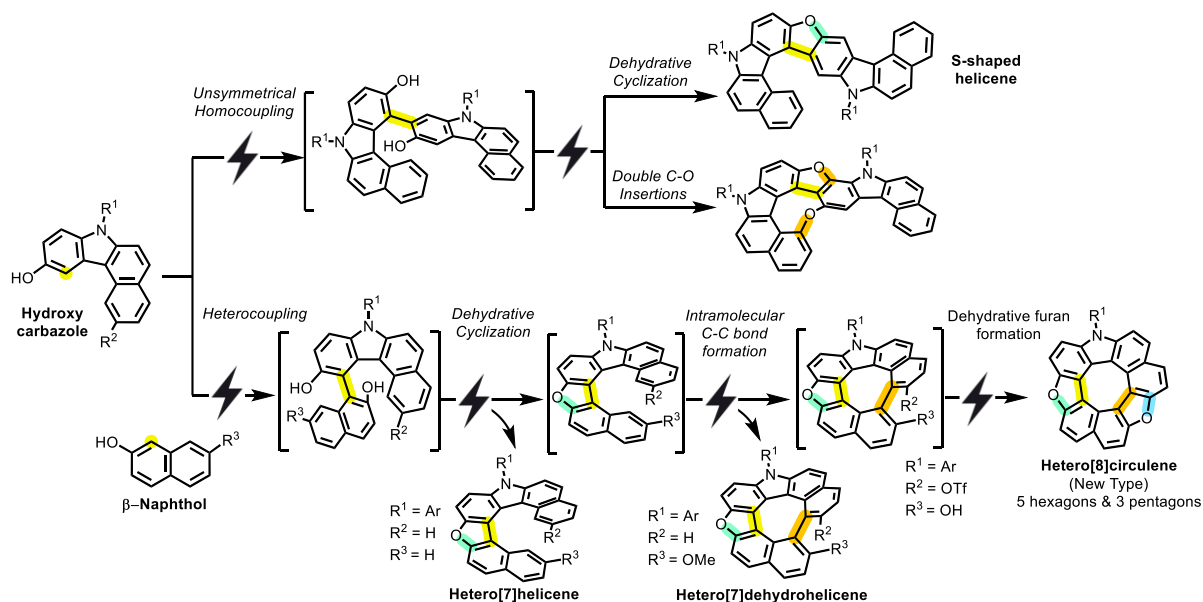


# Electrochemical Cascade Synthesis of Polycyclic Heteroaromatics: A Sustainable Gateway to Functional Optoelectronic and Photocatalytic Materials

Mohamed S. H. Salem (SANKEN, The University of Osaka)

Polycyclic heteroaromatic compounds such as helicenes, dehydrohelicenes, and circulenes are of growing interest due to their distinctive optoelectronic, redox, and chiroptical properties. However, their synthesis remains a synthetic challenge, often requiring harsh conditions and exhibiting poor functional group compatibility. In this lecture, I will introduce the first electrochemical cascade approach to access a diverse library of PHAs in a sustainable and modular fashion. This electrochemical platform leverages differential oxidation potentials to achieve precise control over sequential bond-forming events, and was further streamlined into a one-pot protocol using readily available

starting materials. Comprehensive structural, spectroscopic, and computational investigations reveal distinct electronic architectures and redox profiles. Notably, the synthesized dioxaza[8]circulenes function as efficient metal-free photocatalysts for C–X (X = C, B, S, P) bond-forming reactions under visible-light irradiation, achieving excellent yields without the need for transition metals. Furthermore, the helicene and dehydrohelicene derivatives exhibit remarkable configurational stability and pronounced chiroptical activity, including a record-high blue-region circularly polarized luminescence (CPL) signal with a dissymmetry factor  $|g_{lum}|$  of  $2.5 \times 10^{-3}$  at 433 nm.



## References

- 1) Salem, M. S. H.; Khalid, M. I.; Sako, M.; Higashida, K.; Lacroix, C.; Kondo, M.; Takishima, R.; Taniguchi, T.; Miura, M.; Vo-Thanh, G.; Sasai, H.; Takizawa, S. *Adv. Synth. Catal.* **2023**, 365, 373 (The top 10% of most-viewed papers published by the journal in 2023).
- 2) Khalid, M. I.; Salem, M. S. H.; Sako, M.; Kondo, M.; Sasai, H.; Takizawa, S. *Commun. Chem.* **2022**, 5, 166.
- 3) Gabr, A. S.; Salem, M. S. H.; Khalid, M. I.; Takahashi, R.; Nishimoto, Y.; Yasuda, M.; Takizawa, S. *Nat. Commun.* **2025**, In Press