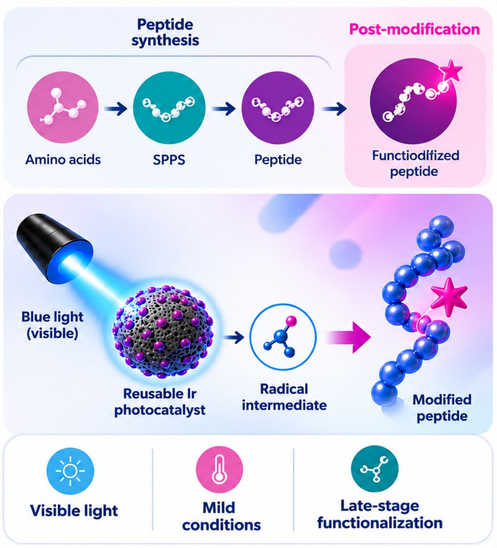
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Reusable Photoredox Catalysts for Sustainable Peptide Synthesis

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INTRODUCTION: PHOTOREDOX CATALYSIS + PEPTIDE POST-MODIFICATION



Peptides are a fast-growing class of therapeutics, and late-stage modification adds non-natural functionality without rebuilding the sequence. Visible-light photoredox catalysis excels here: it drives selective radical chemistry under mild conditions using room temperature and simple LED light (Figure 1); it has already been used to modify amino acids, peptides, and proteins.[1–3] But the most capable photocatalysts are precious-metal complexes used homogeneously and lost after one use, motivating recoverable, reusable catalysts that keep this reactivity.

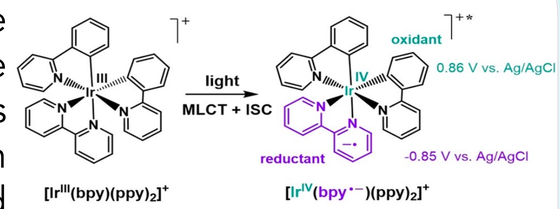


Figure 1. Iridium photoredox catalyst activation under illumination. Upon illumination, the catalyst reaches an excited state, which can act as either a strong oxidant or a strong reductant, allowing a variety of chemical transformations to be performed.

OUR MISSION

Enabling recoverable photoredox catalysis for more sustainable pharmaceutical manufacturing.

Performance • Recovery • Reuse

Ouralia

LIGHT-DRIVEN CHEMISTRY · REUSABLE BY DESIGN

OUR MOTIVATION

Ouralia keeps the molecular performance of photoredox catalysts while making them recoverable, reusable, and circular, cutting waste of one of the world's scarcest precious metals without compromising the chemistry.

THE SCIENCE BEHIND OURALIA

Homogeneous control meets heterogeneous recovery: the molecular Ir catalyst is covalently anchored to a metal-oxide support (Fig. 2), so it filters off and is reusable.[4] Catalysts have been anchored to Al_2O_3, ZrO_2, or ITO as nanopowder or film; the fastest Al_2O_3 system runs the model reaction in 15 min at ≥1000 turnovers.[4]

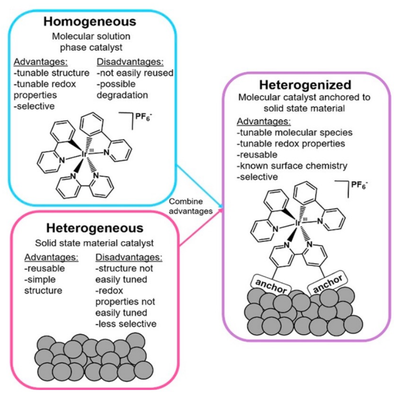


Figure 2. Heterogenized catalysts combine the advantages of homogeneous and heterogeneous catalysis.

Expanded across **five mechanistically distinct reactions** (Fig. 3) at loadings as low as **0.01 mol% Ir**, the heterogenized catalyst runs **faster** than the homogeneous catalyst (Fig. 4) and is reusable ≥5×.[5]

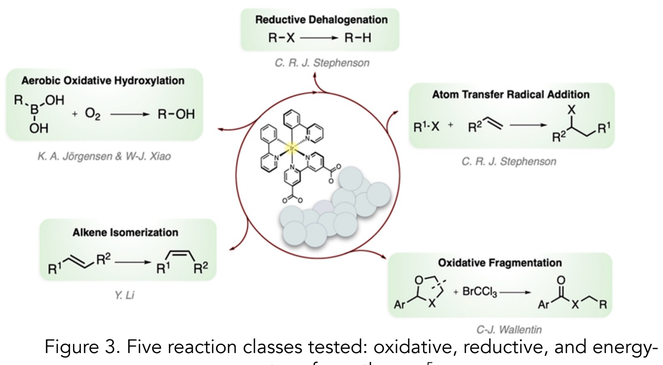


Figure 3. Five reaction classes tested: oxidative, reductive, and energy-transfer pathways.[5]

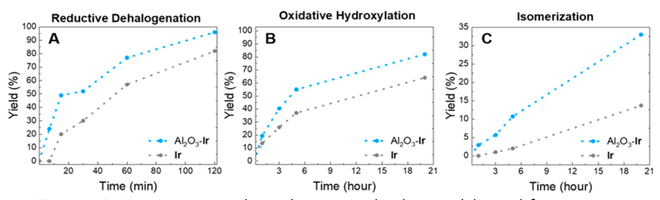


Figure 4. Heterogenized catalysts give higher yields and faster reaction times than homogeneous version.[5]

0.01 mol% lowest Ir loading · **≥1000** turnovers · **5×** catalyst reuse · **99%** gram-scale yield

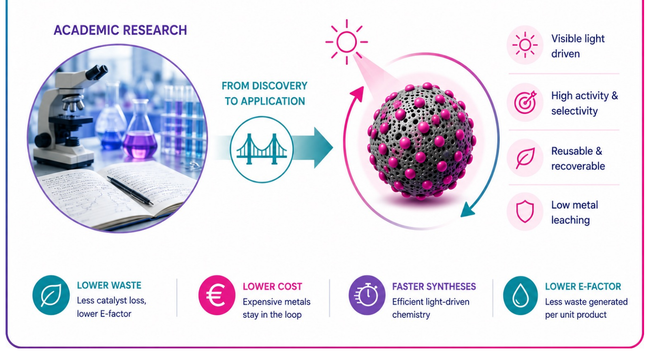
FROM ACADEMIC RESEARCH TO OURALIA

Ouralia builds on the published platform, expanding our catalyst portfolio for peptide post-modification. We achieve reusability and maintain selectivity while keeping a robust catalyst structure.[4,5] The solid catalyst is easily separated from the reaction solution either via filtration (nanopowder) or mechanical extraction (thin film) and can be reused. The catalyst structure can be adapted to your needs and tuned to the desired reactor.

We bring deep expertise, practical know-how, and the agility to accelerate catalyst development.

FROM ACADEMIA TO APPLICATION

Translating academic innovation into a reusable catalyst platform



KEEP THE PERFORMANCE. RECOVER THE CATALYST. REUSE THE PRECIOUS METAL.

APPLICATIONS TOWARD PEPTIDE POST-MODIFICATION

Ouralia's five demonstrated reaction classes map onto high-value peptide transformations. Each card links an established mechanism[5] to a target modification:

THIOL–ENE LIGATION
ATRA / radical addition
ATRA is the closest precedent for radical addition across C=C.[5,6]

DISULFIDE FORMATION / REDUCTION
Oxidative + reductive SET
Both quenching regimes accessible; photoredox cysteine coupling is precedented (oxytocin).[5,1]

DECARBOXYLATIVE C–C
Reductive SET + C-radical chemistry
Reductive activation of Asp/Glu NHPI esters → carbon radical → C–C bond.[5,7,8]

SIDE-CHAIN MODIFICATION
SET / radical diversification
Broad oxidative/reductive radical reactivity for late-stage side-chain edits.[5]

α-AMINO C–H FUNCTIONALIZATION
HAT + radical intermediates
HAT to an **α**-oxy radical models functionalization **α** to nitrogen.[5]

TYROSINE / TRYPTOPHAN MODIFICATION
Oxidative SET / arene functionalization
Oxidative SET → tyrosyl-radical bioconjugation and dityrosine cross-linking.[5,2]

COLLABORATION OPPORTUNITIES

GEN 1 CATALYSTS — AVAILABLE FOR TESTING

Our published reusable Ir photoredox catalysts are available to researchers and companies interested in evaluating the platform in their own chemistry.

JOINT DEVELOPMENT

We are seeking industry partners to jointly develop and validate reusable photoredox catalysts for peptide post-modification and other high-value synthetic applications.

INTERESTED IN TESTING OUR CATALYSTS OR DEVELOPING AN APPLICATION TOGETHER? LET'S TALK.

CONCLUSIONS

Ouralia is turning a published, reusable Ir-photoredox platform into robust catalysts for peptide post-modification and seeking partners to co-develop and validate applications.[4,5]

CONTACT US!

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