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Synthesis covered in 2024

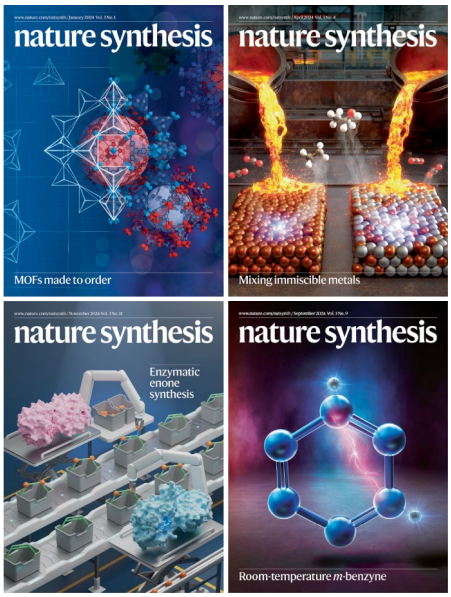
In this Editorial, we look back on 2024 and highlight some of the outstanding covers featured in Nature Synthesis as well as the excellent research they represent.

Over the past year, we have received some wonderful cover images from authors which provide eye-catching and appealing snapshots of research published in *Nature Synthesis*. We wish to take this opportunity to look back on some of the topics we have covered in 2024.

In the January issue (pictured, top left), we featured an Article by Vincent Guillerm, Mohamed Eddaoudi and co-workers on the face-directed assembly of zeolite-like metal–organic frameworks (MOFs). The cover image shows the design of these MOFs inspired by architectural techniques. In this work, polytopic expanding and tightening structure-directing agents are used which control and alter the orientation of adjacent supermolecular building blocks. This approach uses several metal cations (In, Fe, Co and Ni) and structure-directing agents to prepare >20 isoreticular MOF structures, ranging from those with small pore apertures to those with 48 Å-wide mesopores which can be used in various separation and gas storage applications.

On the theme of supramolecular chemistry, the June issue featured an Article on the synthesis of mirror-image versions of naturally occurring cyclodextrins through 1,2-*cis*-L-glucosylation, one-pot glycosylation, and diastereoselective cyclization reactions.

Moving onto the April issue (pictured, top right), we featured an Article by Dae-Hyun Nam, Eun Soo Park, Young-Chang Joo and co-workers on a coordination-controlled metal alloy with Cu clusters spatially dispersed in a crystalline Ag lattice for use in the electrochemical reduction of CO_2. This powerful cover image shows the metallurgical alloy electrocatalysts being formed. To overcome limitations in the miscibility of Cu and Ag, sacrificial elements, such as Al, are first incorporated with thermodynamically guided compositions to form intermetallic compounds and the sacrificial elements are then selectively dealloyed. While Cu catalysts prepared in this work are selective for ethylene, the Ag–Cu solid-solution catalyst is found to be ethanol-selective.



A selection of *Nature Synthesis* cover images from 2024. January issue (top left), April issue (top right), November issue (bottom left) and September issue (bottom right).

Electrocatalysis proved to be a highly featured topic in the journal this year with the March issue featuring an Article using a robotic artificial-intelligence chemist used to prepare oxygen-producing electrocatalysts from Martian meteorites. Furthermore, a Focus issue in July examined the electroreduction of CO_2 to form carbon–heteroatom bonds.

This year we also saw some interesting examples of biocatalytic approaches in synthesis. In the November issue (pictured, bottom left), we featured an Article by Marc Garcia-Borràs, Zhen Liu and co-workers on an enzymatic desaturation system based on flavin-dependent ene-reductases for the desymmetrization of cyclohexanones. Quaternary stereocentres are common in bioactive molecules and this method provides access to a range of chiral cyclohexenones bearing these stereocentres with excellent enantioselectivity. Interestingly, applying this biocatalytic strategy for the synthesis of enones by reductively desymmetrizing cyclohexadienones gives the opposite enantiomer compared to the desaturation system, demonstrating the enantiodivergence of the flavin-based approaches. The cover shows the two types of products being prepared, depending on the starting material.

Desymmetrization reactions were not the only biocatalytic reactions featured on the cover of *Nature Synthesis* this year, with an Article by Q. Zhao et al. and an Article by L.-P. Zhao et al. in the August issue reporting enzymatic C(sp^3)–F bond formation.

In the September issue (pictured, bottom right), we featured an Article by Kenta Koyamada, Kazunori Miyamoto and Masanobu Uchiyama on the room-temperature and atmospheric-pressure synthesis of *m*-benzyne in solution. This cover shows *m*-benzyne represented as a diradical. While methods to prepare *o*- and *p*-benzynes have been established, *m*-benzyne has proven experimentally challenging to access. A phenyl-λ^3-haloganyl moiety as a 'hyper'-leaving group is used to enable the synthesis of *m*-benzyne, which is shown to behave as a potent electrophile but with weak free-radical character. Additionally, trapping *m*-benzyne with a range of nucleophiles, as well as a successive *m*-benzyne generation and trapping sequence, provides access to multi-substituted benzenes.

Thanks to our authors who submitted great covers in 2024 and for providing wonderful options to choose from each month. With 2025 underway, we are excited to see what this new year brings for research in synthesis and of course the cover images to go along with it.

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