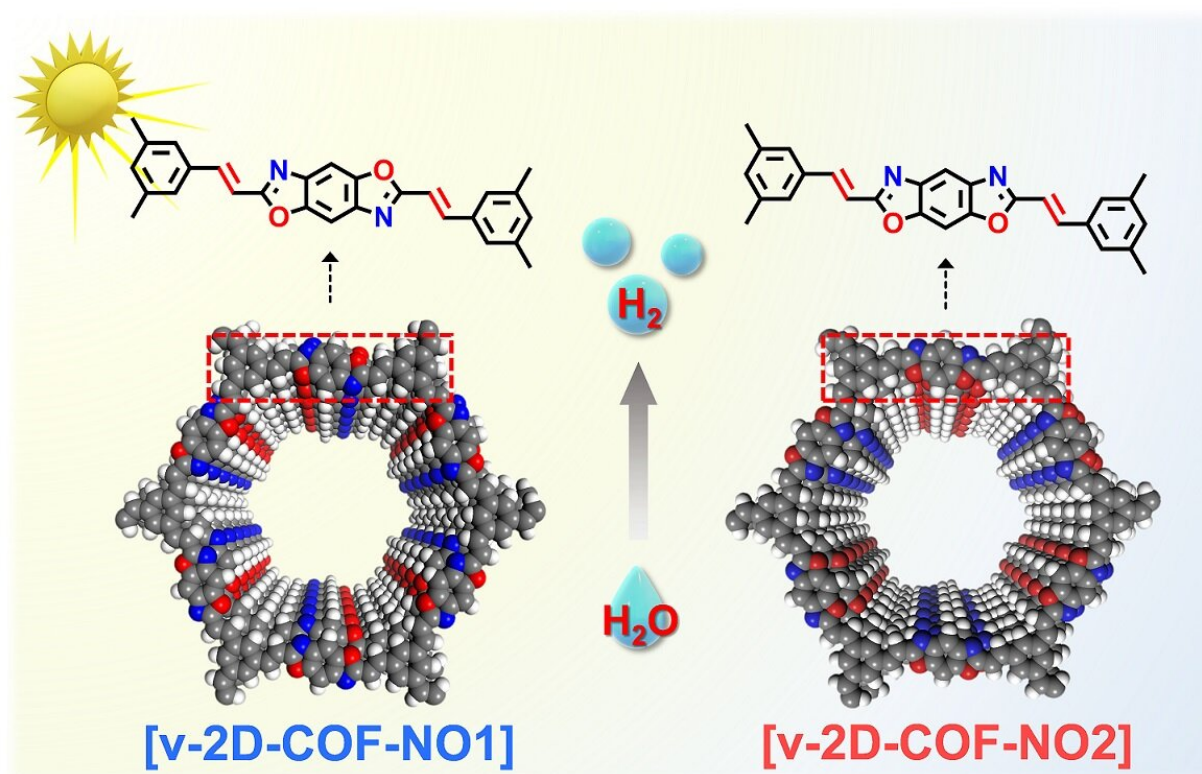


# Novel isomeric vinylene-linked covalent organic frameworks developed with distinct photocatalytic properties

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The isomeric vinylene-linked covalent organic frameworks. Credit: NIMTE

Researchers led by Prof. Zahng Tao at the Ningbo Institute of Materials Technology and Engineering (NIMTE) of the Chinese Academy of

Sciences has synthesized two novel vinylene-linked two-dimensional covalent organic frameworks (v-2D-COFs) with isomeric structures via benzobisoxazole-mediated aldol polycondensation, showing distinct photocatalytic properties. The study was published in *Journal of the American Chemical Society*.

Thanks to their excellent in-plane conjugation and high chemical stability, v-2D-COFs have attracted increasing interest and thus emerged as advanced semiconducting materials. However, exploring new synthesis approaches and delving into the physical and chemical properties of v-2D-COFs remain challenging, due to the limited chemical reactions and monomers applied in v-2D-COFs.

To address this issue, the researchers proposed a solid-state benzobisoxazole-mediated aldol polycondensation reaction. Based on this innovative reaction, two novel isomeric benzobisoxazole-bridged v-2D-COFs (v-2D-COF-NO<sub>1</sub> and v-2D-COF-NO<sub>2</sub>) with trans/cis configurations for benzobisoxazole linkages were constructed.

The two synthesized isomeric v-2D-COFs showed similar crystalline structures in terms of molecular formulas, unit cells, and pore sizes. Nevertheless, they exhibit evident differences in optoelectronic and electrochemical properties, such as [light absorption](#) and emission and charge-transfer properties, according to the results of the ultraviolet-visible (UV-vis) [absorption spectra](#) and ultraviolet photoelectron spectroscopy.

Specifically, under AM 1.5G ([solar irradiation](#) standard spectrum) irradiation at -0.3 V vs reversible hydrogen electrode, the v-2D-COF-NO<sub>1</sub> with trans-benzobisoxazole showed better photoelectrochemical performance than v-2D-COF-NO<sub>2</sub>.

Employing Pt as cocatalysts, the v-2D-COF-NO<sub>1</sub> showed excellent

photocatalytic hydrogen evolution rate, twice the value of v-2D-COF-NO<sub>2</sub>.

This study provides a novel approach of benzobisoxazole-mediated aldol polycondensation to enrich the family of v-2D-COFs, and sheds light on the isomerization-mediated photocatalytic properties of v-2D-COFs.

**More information:** Shengxu Li et al, Direct Construction of Isomeric Benzobisoxazole–Vinylene-Linked Covalent Organic Frameworks with Distinct Photocatalytic Properties, *Journal of the American Chemical Society* (2022). [DOI: 10.1021/jacs.2c06042](https://doi.org/10.1021/jacs.2c06042)

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