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Cu-MOF as a saturable absorber for mode-locking at 2 μm and beyond

By

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Abstract

In this study, a copper-based metal-organic framework (Cu-MOF) was synthesized using terephthalic acid (TPA, H₂L), 1,2-bis(4-pyridyl)ethene (bpe) as organic binders, and Cu²⁺ ions, to act as a saturable absorber (SA) material. The SA was fabricated by depositing Cu-MOF on an arc-shaped fiber, and was then incorporated into a thulium-doped fiber laser (TDFL) and a holmium-doped fiber laser (HDFL), with both achieving stable mode-locking operation. The SA exhibited a modulation depth of 5.7% and a saturation intensity of 13.8 MW/cm², respectively. The maximum average output power of the TDFL was 6.82 mW, while that of the HDFL was 2.64 mW. Pulse widths were measured at 1.08 ps for the TDFL and 1.75 ps for the HDFL respectively. The TDFL achieved a pulse energy of 464 pJ and a peak power of 430 W. The output of the HDFL had a pulse energy of 180 pJ and a peak power of 94.9 W, respectively. Both lasers were monitored for 4 h to ensure their stability.

Keywords

Author Keywords: [Mode-locking](#); [Saturable absorber](#); [Metal-organic frameworks](#); [Thulium-doped fiber laser](#); [Holmium-doped fiber laser](#)
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Data availability statement

The datasets analysed during this study are available from the corresponding author on reasonable request.

Conflict of interest statement

The datasets analysed during this study are available from the corresponding author on reasonable request.

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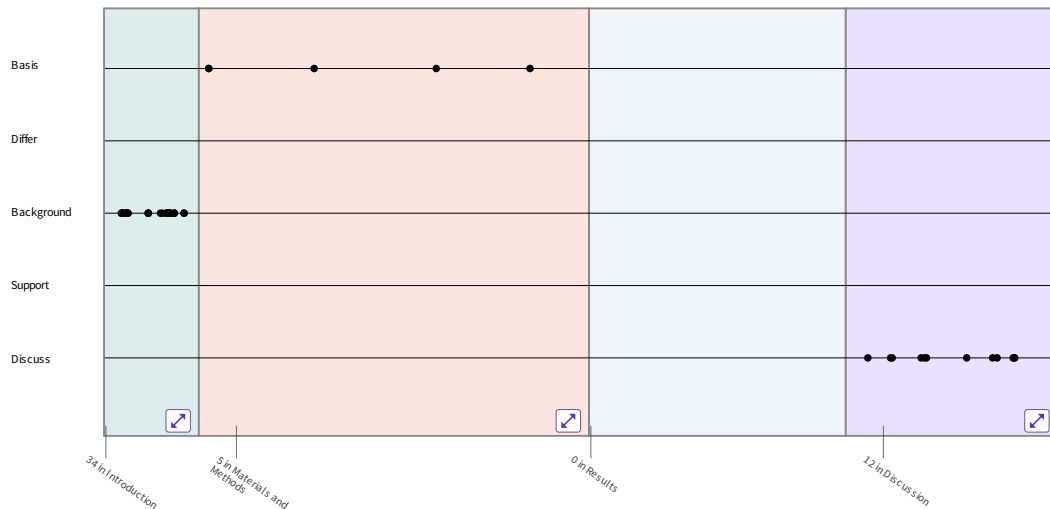
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