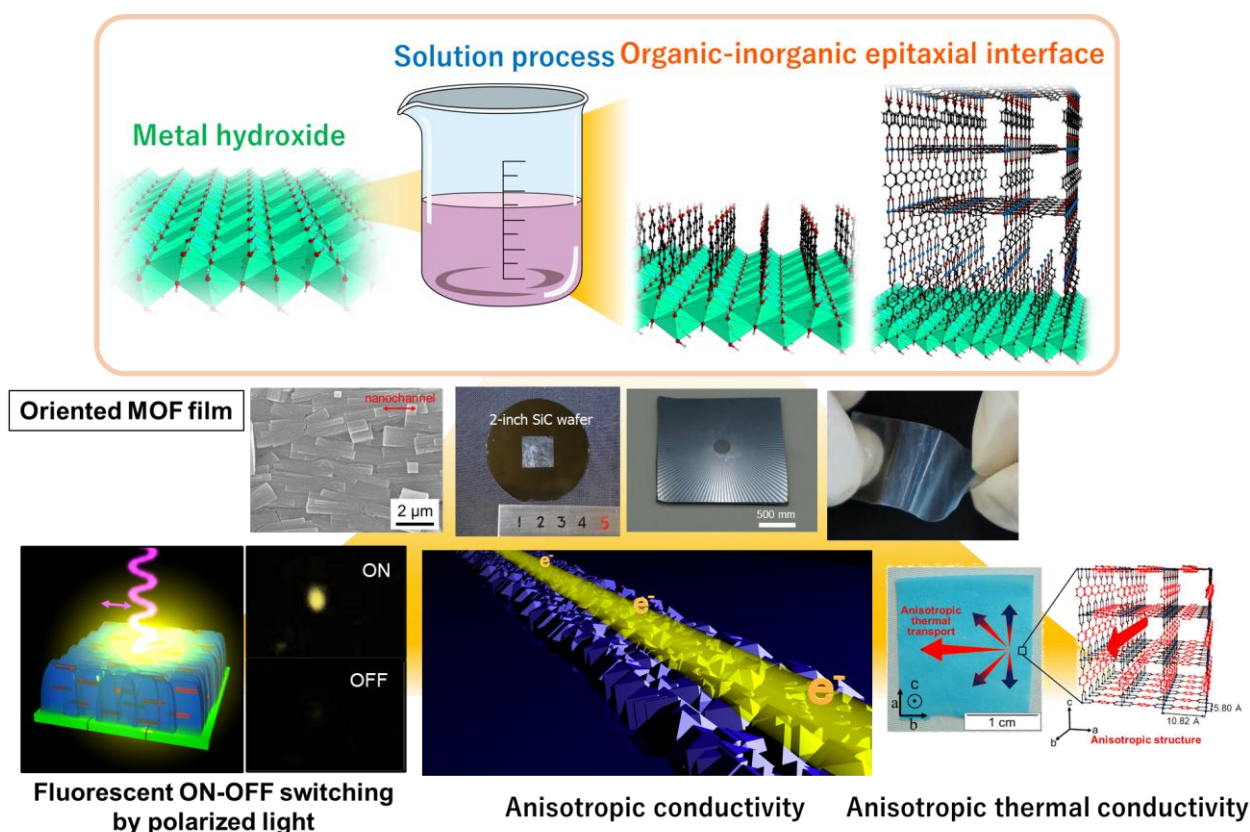


“Organic-inorganic epitaxial interface” for oriented growth of framework compounds

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Precise control over material interfaces, especially through lattice matching, is crucial for fabricating highly functional, oriented thin films. While inorganic epitaxy has long been a cornerstone of semiconductor technology, we have developed a novel organic-inorganic epitaxial approach on inorganic compounds, specifically metal hydroxides, to grow oriented metal-organic framework (MOF) films [1-7]. Our method leverages the ordered surface hydroxyl groups (M-OH) of crystalline metal hydroxides. These groups act as a template, guiding the alignment of organic linkers to establish a well-defined epitaxial interface, which in turn enables the growth of highly oriented MOF films. Achieving macroscopic control over the orientation of MOF micropores is key to unlocking unique anisotropic properties. These properties are essential for developing advanced electronic, optical, and thermal devices. The oriented pores facilitate host-guest interactions by precisely accommodating functional guests, such as molecules, ions, or nano-objects. For instance, we have demonstrated that oriented MOF films loaded with fluorescent molecules exhibit distinct polarization-dependent optical responses [2, 5]. In this presentation, I will review our recent progress in the fabrication of oriented MOF films and related framework compounds. I will also highlight their unique applications, focusing on their remarkable optical, electrical, and thermal properties.



References

- [1] P. Falcato, K. Okada, et al., *Nature Mater.* 2017, 16, 342. [2] K. Okada, et al., *Chem. Sci.* 2020, 11, 8005. [3] K. Okada, et al., *J. Mater. Chem. A* 2021, 9, 19613. [4] B. Baumgartner, et al., *Angew. Chem. Int. Ed.* 2022, 61, e202201725 [5] K. Okada, et al., *Nanoscale Adv.* 2023, 5, 1795 [6] Y. Koseki, K. Okada, et al., *Nanoscale* 2024, 16, 14101 [7] Y. Toki, K. Okada, et al., *Small Sci.* 2025, 2400634