Modulator Chemistry Unlocks Tunable Enzyme Performance in MOFs

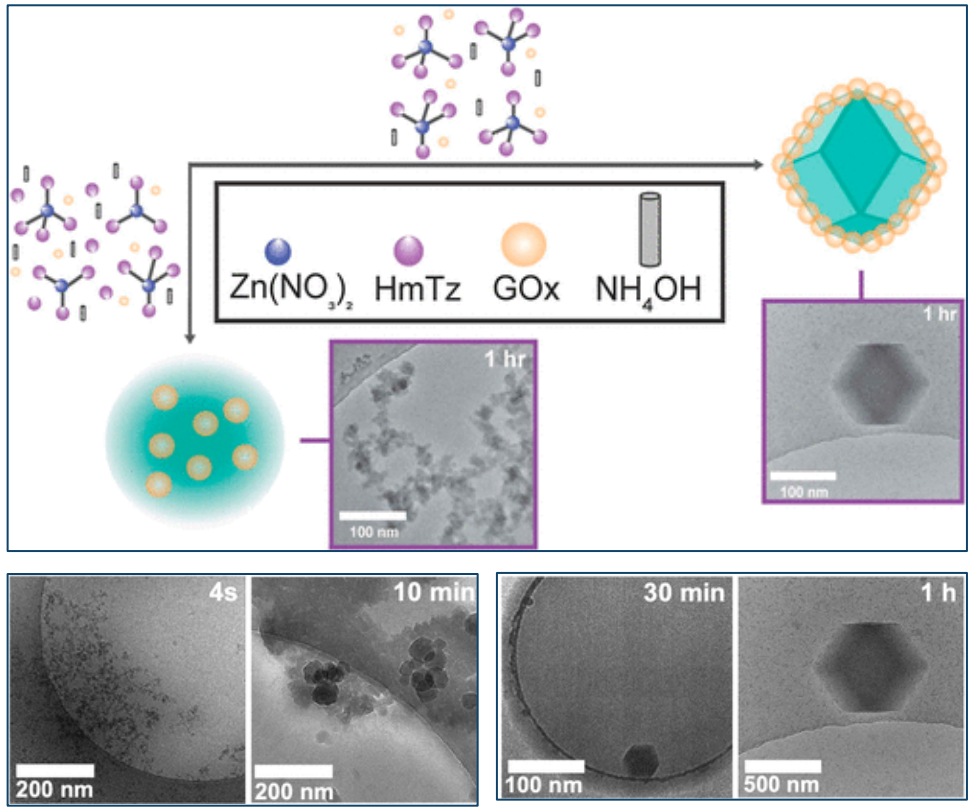

Figure: Nucleation and growth studies were conducted using time-resolved cryo-TEM to establish the crystallization mechanism for metal azolate framework-7 (MAF-7).

Scientific Achievement

The first mechanistic insight into how ammonium hydroxide controls both crystal growth modes and enzyme folding in MAF-7, revealing a tunable pathway to optimize enzyme performance.

Significance and Impact

Modulator chemistry advances rational design strategies for enzyme@MOFs beyond ZIFs and toward more tunable, biocompatible frameworks.

Research Details

- Applied time-resolved cryo-TEM with functional assays to directly link crystallization pathways (classical vs. nonclassical) with enzyme structure and activity.
- Established modulator chemistry (NH_4OH) as a design tool for biocompatible enzyme@MOF systems, expanding beyond ZIF-based frameworks to enable tailored biocatalysis.

Olivas, E. M.; Rose, B.; Carpenter, B. P.; Talosig, A. R.; Di Palma, G.; Lee, J.; Mulvey, J. T.; O' Leary, S. L.; Watt, J.; Patterson, J. P. Role of Ammonium Hydroxide on Glucose Oxidase Immobilized in Metal–Azolate Framework-7 Enzyme Activity. *Chemistry of Materials.* 2025.

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