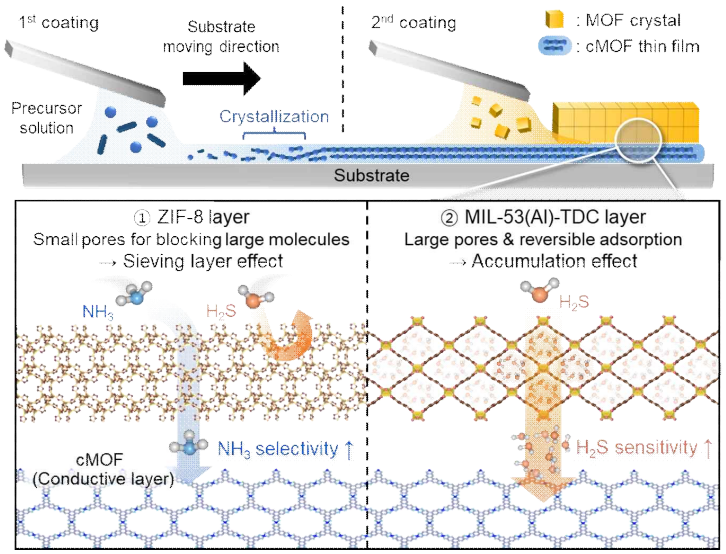
붙임2 **Research Outcomes Report**

Research Outcomes	Dual-MOF-Layered Films via Solution Shearing Approach: A Versatile Platform for Tunable Chemiresistive Sensors
Performance Objectives	Published in a Top 10% JCR Journal
Type of Performance	☑ Research Article(Paper) ☐ Patents ☐ Researcher Exchange ☐ Researcher Engagement ☐ Information Exchange ☐ Others
Description of Performance Type	Published in ***ACS Nano*** (JCR top 7.9%)
Research Institutes	Korea Advanced Institute of Science and Technology (KAIST) / Prof. Il-Doo Kim / Chungseong Park, et al. (7 others)
Attachments (Image, Photograph, Ect.)	 <Schematic Illustration of the Fabrication Process and Functionalities of Metal-Organic Framework (MOF)-Based Bilayer Thin Films>
Achievement Date	2025.03.13
Summary of Performance	- Development of a fabrication process for bilayer thin films (<1 μm) by stacking a porous MOF on top of a conductive MOF - Selective permeation/concentration of various target molecules depending on the MOF type, with conversion of chemical interactions into electrical signals - Process applicable to various substrates, enabling large-area synthesis and expansion into an energy materials platform - This work was published in ***ACS Nano***, a high-impact international journal ranked in the top 7.9% by JCR
Description of Performance	■ **Key Features** - Development of a bilayer MOF thin film structure by vertically stacking MOFs with different properties on a conductive MOF layer - Precise thickness control and large-area synthesis enabled by microfluidics-based solution shearing techniques ■ **Performance** - Fine control of film thickness in the range of several to hundreds of nanometers - Simultaneous fabrication of over 300 thin-film devices on a 50×50 mm area - Selective permeation/concentration of specific substances depending on the MOF type (e.g., >10× improved selectivity for NH_3 using ZIF-8 2.6× higher sensitivity to H_2S using MIL-53(Al))

	■ **Excellence of the Results** - Tunable selectivity, sensitivity, response time, and recovery characteristics through precise control of MOF layer composition and structure - Custom material design for specific target molecules by combining MOFs with diverse pore sizes and adsorption properties - Demonstrated potential for commercialization through compatibility with roll-to-roll scalable thin-film fabrication processes ■ **Uniqueness of the Results** - Overcoming the limitations of single-material systems by engineering the interface between MOF layers, enabling simultaneous enhancement of sensitivity, selectivity, and recoverability via controlled molecular permeability - Proposes a new sensitivity enhancement mechanism based on molecular accumulation, going beyond simple molecular sieving via pore size in conventional MOF layers