Organic-inorganic epitaxial interface on metal hydroxides as scaffold for oriented framework compound films with unique properties

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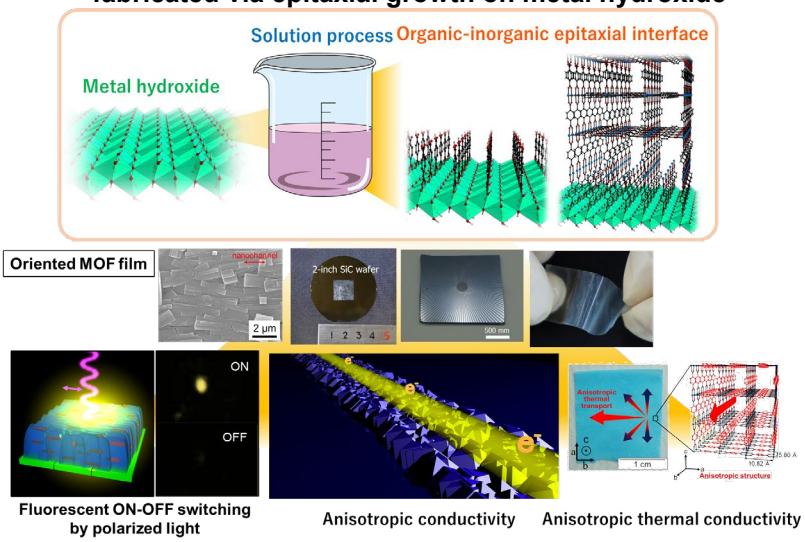
ABSTRACT:

Precise control of the material interface, i.e., lattice matching at the interface, is important for the fabrication of oriented thin films with sophisticated functionalities. In the field of inorganic materials, epitaxial growth by lattice matching at the interface has been deeply investigated and contributed to the development of semiconductor devices. We have been reporting unique organic-inorganic epitaxial interface on metal hydroxides which allowed the fabrication of oriented metal-organic framework (MOF) films (Figure 1)[1-6]. Crystalline metal hydroxides have hydroxyl groups (M-OH units) regularly arranged on their surface of which alignment reflects their crystalline structure. The ordered array of hydroxyl groups defines the alignment of the organic molecules on the surface (organic-inorganic epitaxial interface), affording the fabrication of oriented MOF films [1]. Because the MOF micropores are aligned to the specific directions in the macroscopic scales in the oriented MOF films, thin films with anisotropic properties for advanced technologies including electronic, optical, and thermal devices can be achieved via a host-guest approach by an accommodation of functional guests (molecules, ions, or nano objects) into the pores. For example, oriented MOF films impregnated with fluorescent molecules exhibited polarization-dependent optical responses[3]. In this presentation, our resent progress on the fabrication and applications (unique optical, electrical, and thermal properties) of oriented MOF films will be reviewed.

Figure 1 : Anisotropic optical, electrical, and thermal properties by oriented MOF film fabricated via epitaxial growth on metal hydroxide



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