# Molecular-templated ALD on Mixed SAM to Achieve Unimolecular Dispersion and In-process Fluorescent Monitoring of Template Molecules

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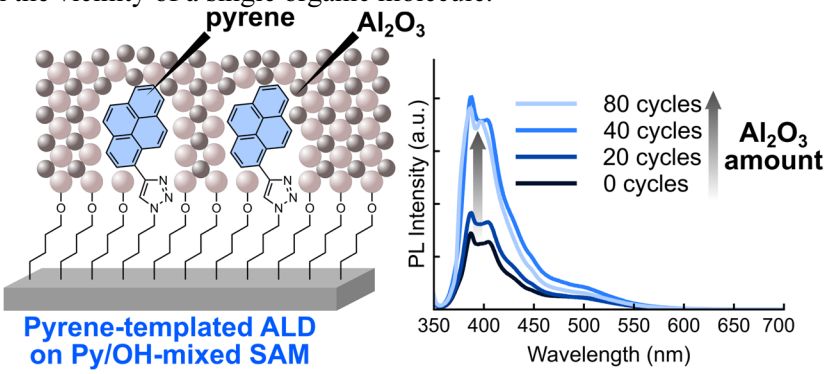
Atomic layer deposition (ALD) in the presence of organic template molecules on substrates (molecular-templated ALD) is a promising technique for designing a molecular selectivity with thermally robust metal oxides. However, self-aggregations of template molecules impair the selectivity of the resulting molecules, which is difficult to prevent or observe. Here, we propose a rational method for unimolecularly dispersing template molecules and revealing their states in the molecular-templated ALD process. Pyrene templates were dispersed into OH-terminated self-assembled monolayers (SAMs), enabling their fluorescence to monitor the microenvironments around the templates.

Mixed SAMs where pyrene templates were dispersed in the OH-terminus allowed the pyrene molecules to be 1) covalently immobilized, 2) isolated from other pyrene molecules, and 3) surrounded by ALD-reactive OH groups.[1] Systematic spectroscopic studies of pyrene probes revealed the successful ALD of metal oxides surrounding pyrene templates without their undesired aggregations. Furthermore, when $Al_2O_3$ was deposited, pyrene fluorescence showed enhanced intensity, lifetime, and quantum yield. These improvements in fluorescence are attributed to the suppression of non-radiative decay, indicating the growth of $Al_2O_3$ in the vicinity of a single organic molecule.[2]

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