Electronic Supplementary Material (ESI) for Nanoscale.

SUPPLEMENTARY INFORMATION

Understanding the Role of Surface Interactions in the Antibacterial Activity of Layered Double Hydroxide Nanoparticles by Atomic Force Microscopy

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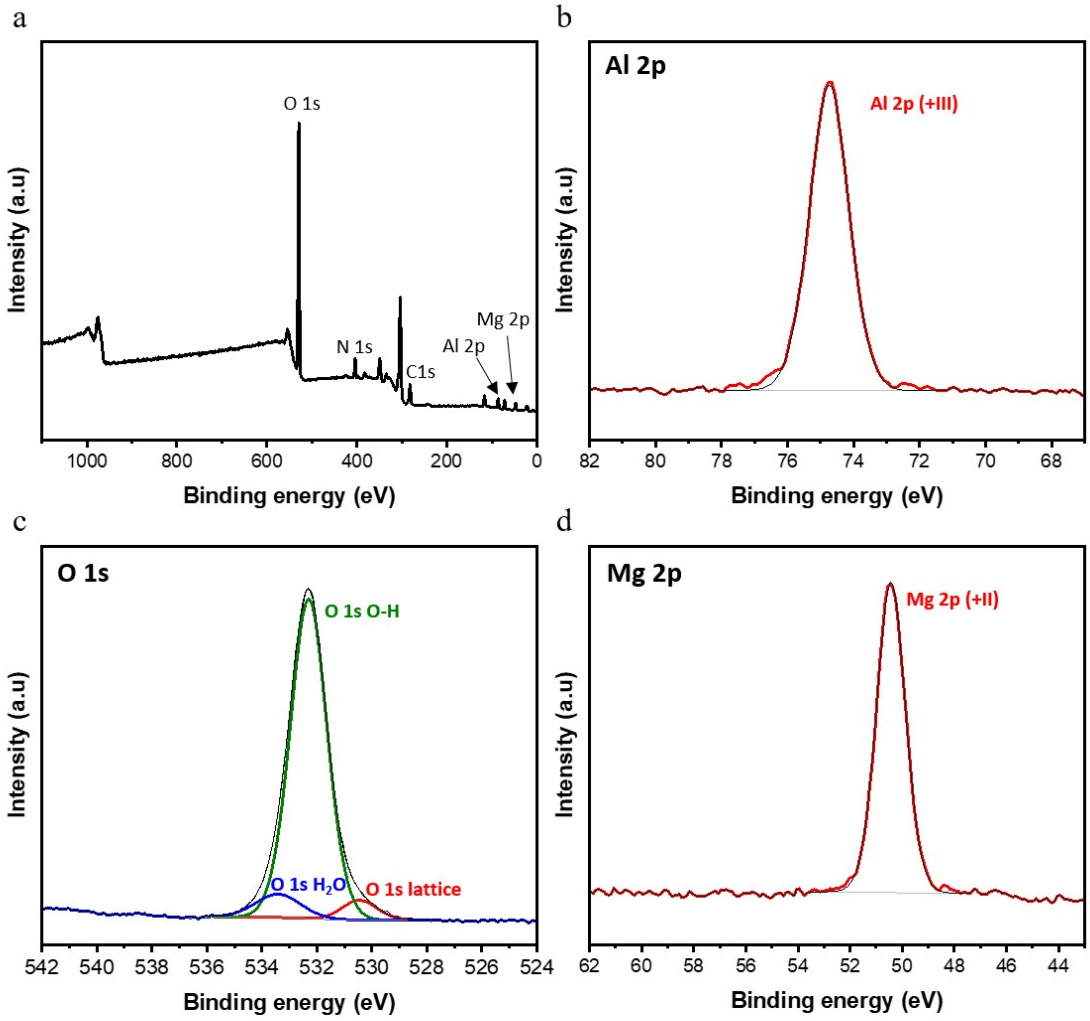


Figure S1. XPS spectra of MgAl LDH NPs. (a) Full spectrum. (b) Al2p region. (c) O1s region. (d) Mg2p region.

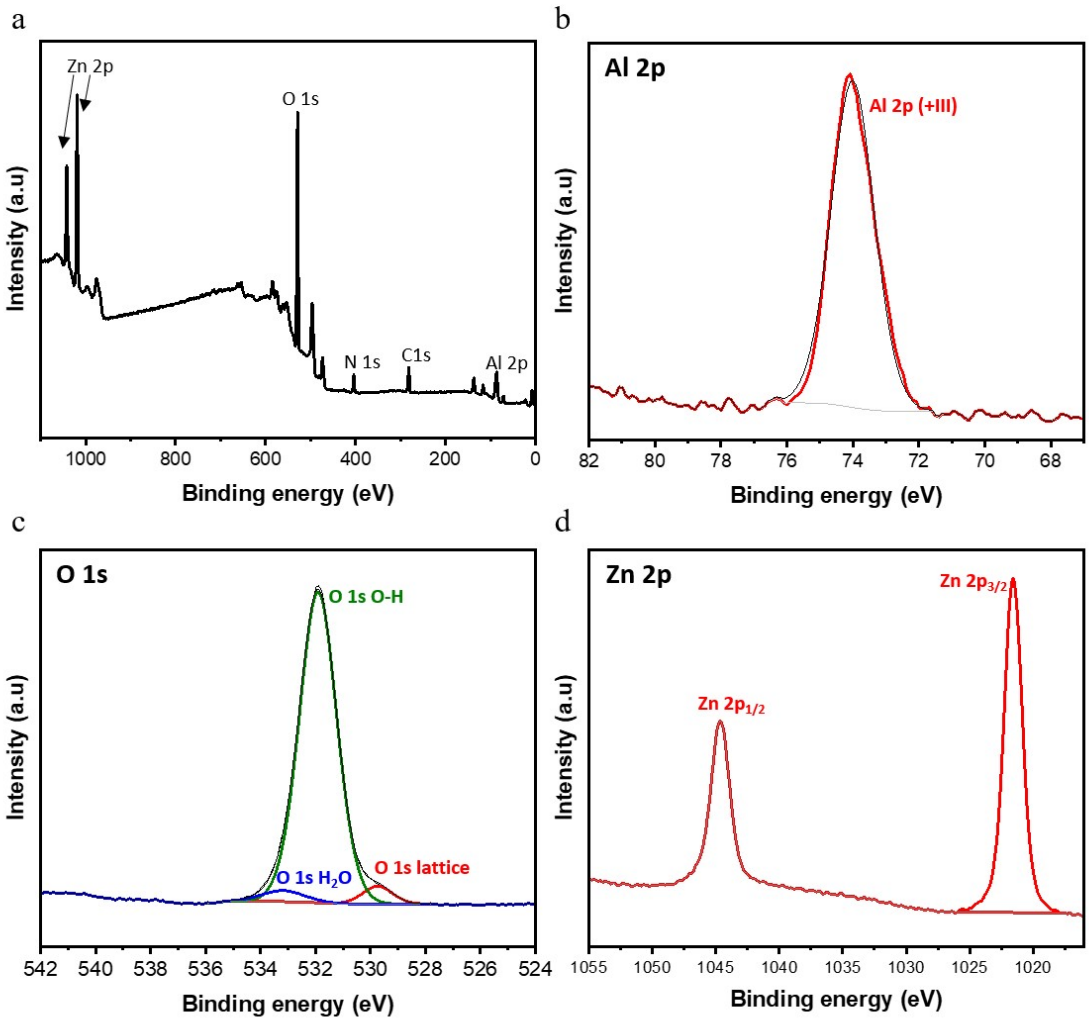


Figure S2. XPS spectra of MgAl LDH NPs. (a) Full spectrum. (b) Al2p region. (c) O1s region. (d) Zn2p region.

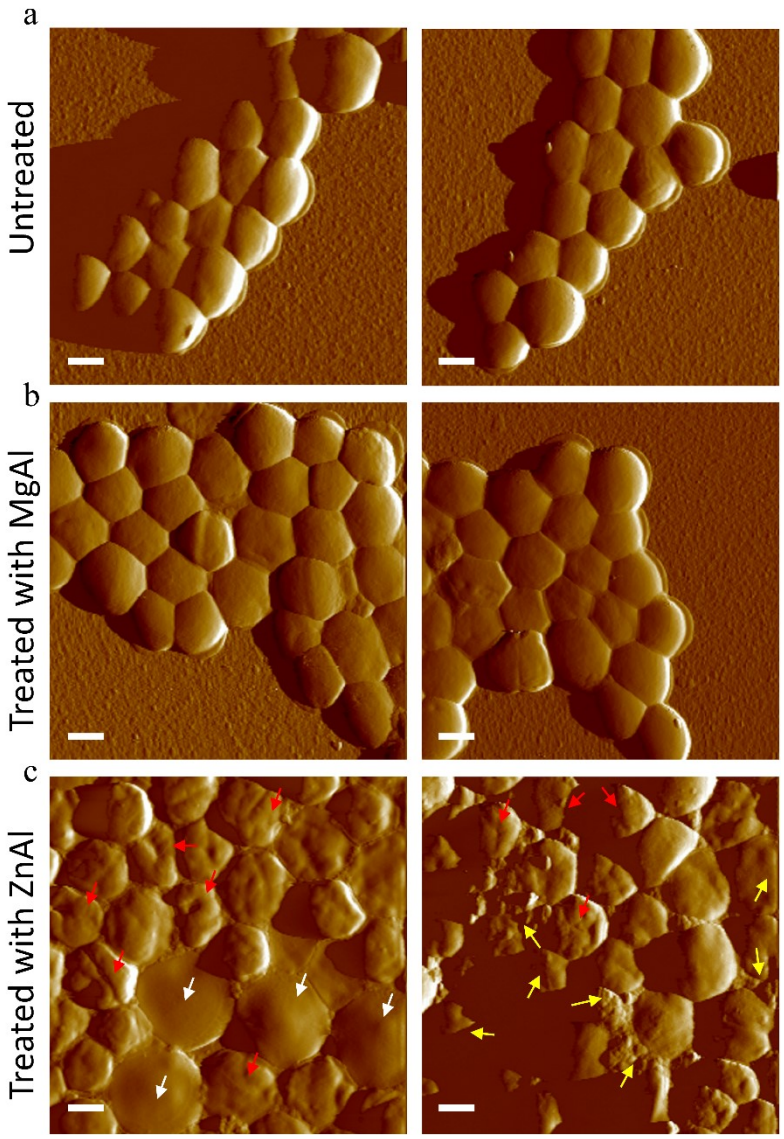


Figure S3. AFM deflection images of *S. aureus* in air (Scale bar = 500 nm). (a) Untreated *S. aureus* cells. (b) *S. aureus* cells treated with MgAl LDH NPs at MIC value of ZnAl LDH NPs. (c) *S. aureus* cells treated with ZnAl LDH NPs at MIC. White arrows point to enlarged swelled cells. Red arrows point to distorted cells. Yellow arrows point to cell debris.

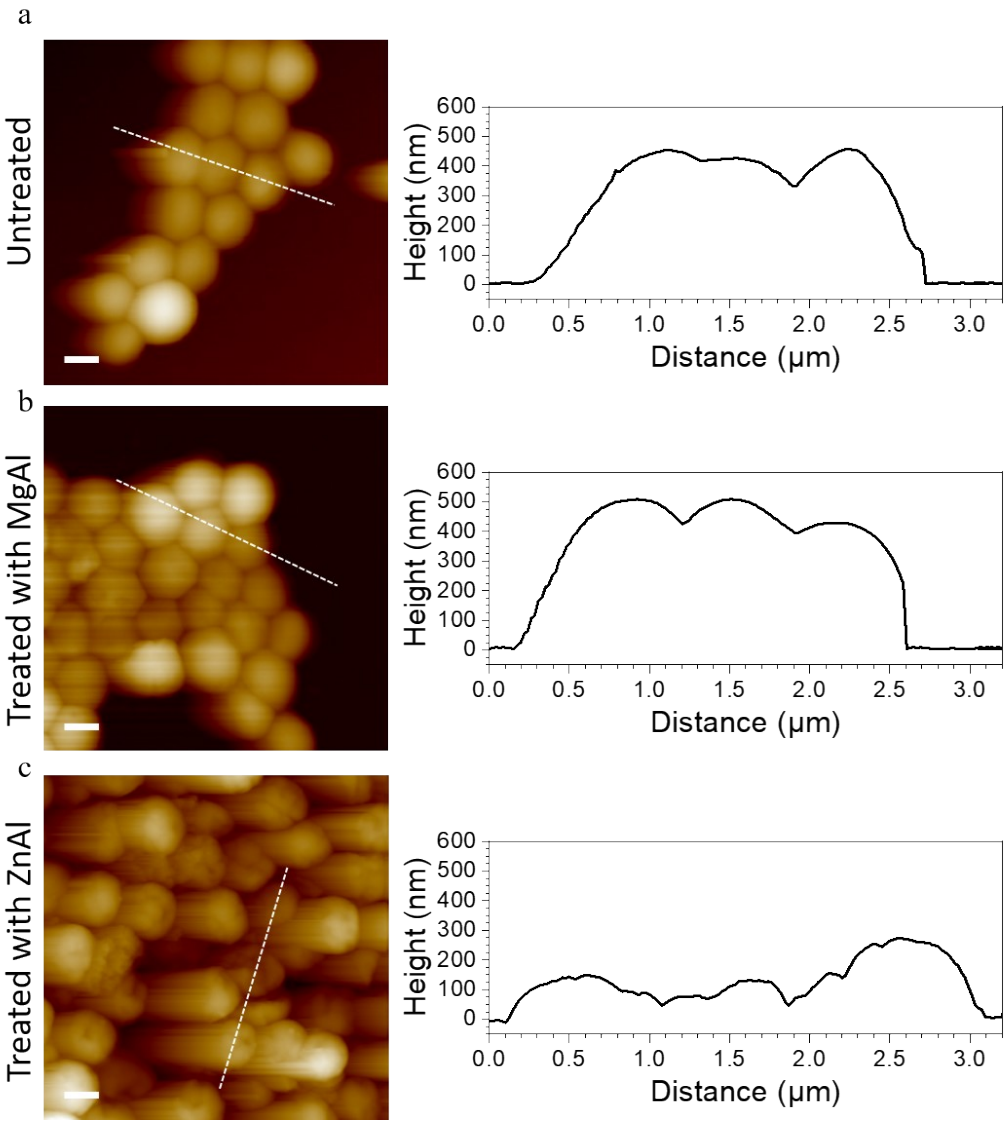


Figure S4. AFM height images of *S. aureus* cells in air (Scale bar = 500 nm) together with the height profiles of three cells taken along the dashed lines marked on their AFM height images. (a) Untreated *S. aureus* cells. (b) *S. aureus* cells treated with MgAl LDH NPs at MIC value of ZnAl LDH NPs. (c) *S. aureus* cells treated with ZnAl LDH NPs at MIC.

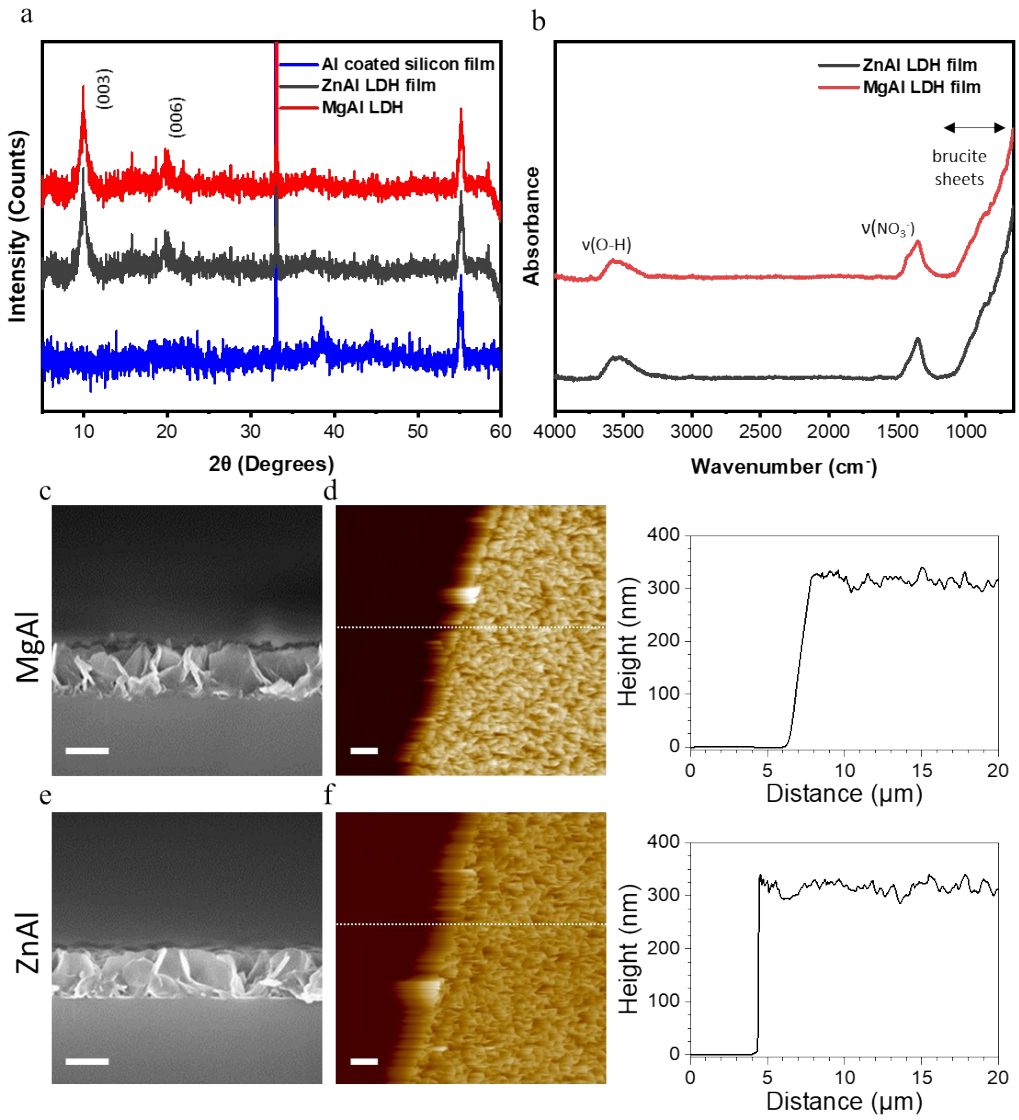
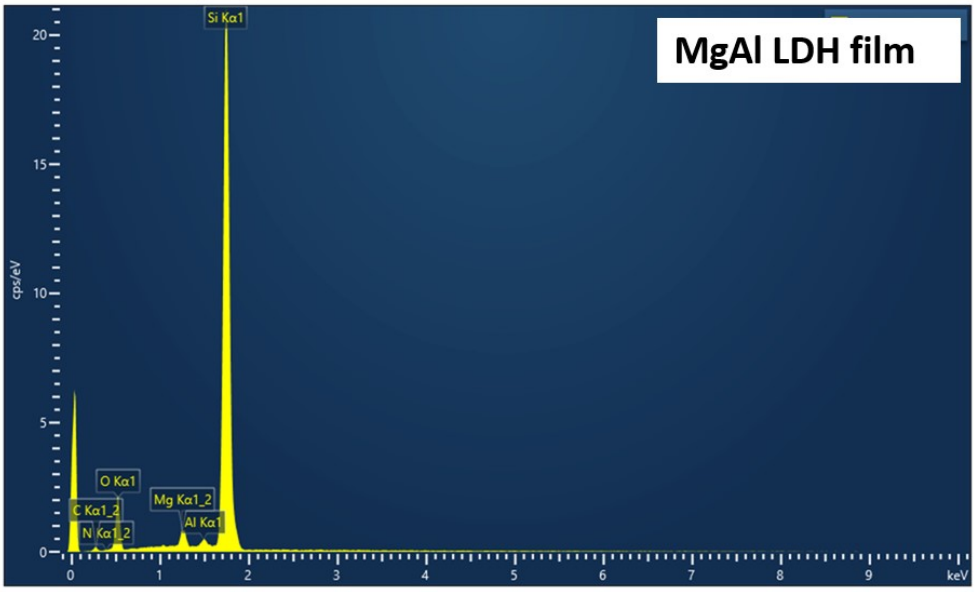


Figure S5. LDH films characterization. (a) XRD patterns of MgAl and ZnAl LDH films. (b) FTIR spectra of MgAl and ZnAl LDH films. (c,e) SEM cross-sectional images of MgAl (c) and ZnAl (e) LDH films (Scale bar = 250 nm). (d,f) AFM height images of MgAl (d) and ZnAl (f) LDH films interfaces with silicon substrates revealed by a scratch (Scale bar = 2 μm) together with their height profiles. The dashed lines marked on the height images represent the sections used to determine the height profiles of the films.

a



b

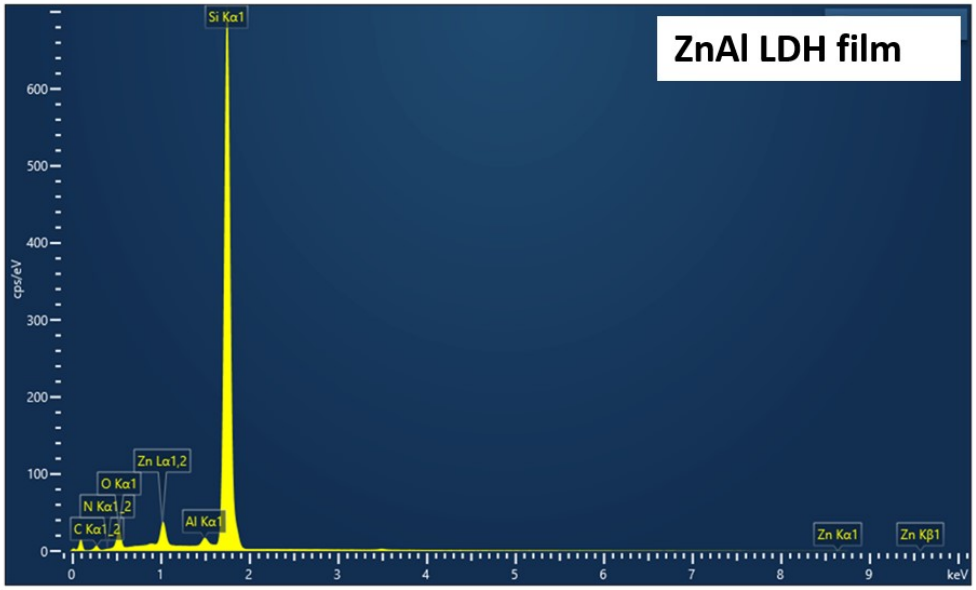
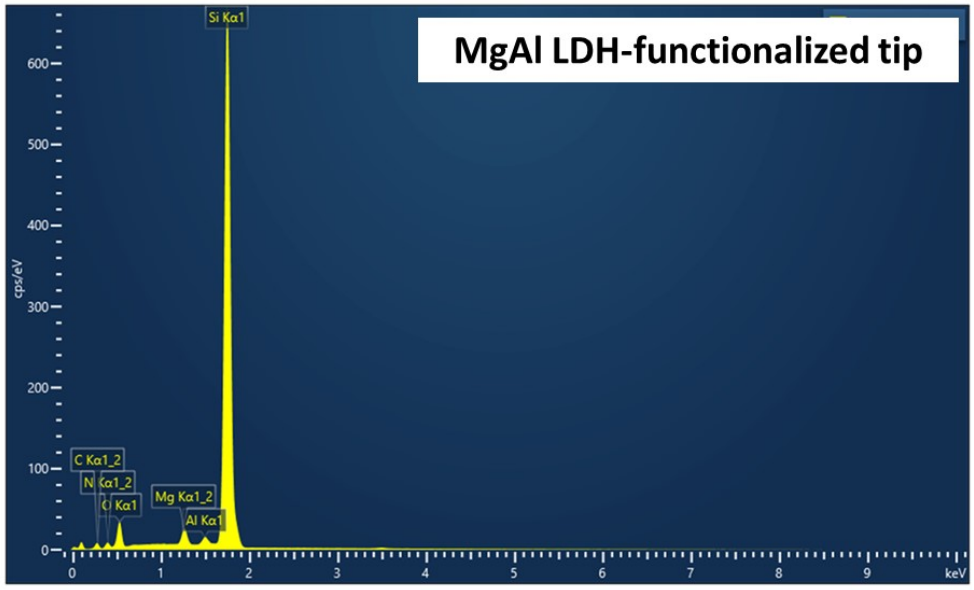


Figure S6. EDS spectra of LDH films grown on silicon wafers. (a) MgAl LDH film. (b) ZnAl LDH film.

The peak appearing at 0 keV in the spectra of MgAl LDH film (**Figure S6**) is attributed to the noise from the EDS detector.

a



b

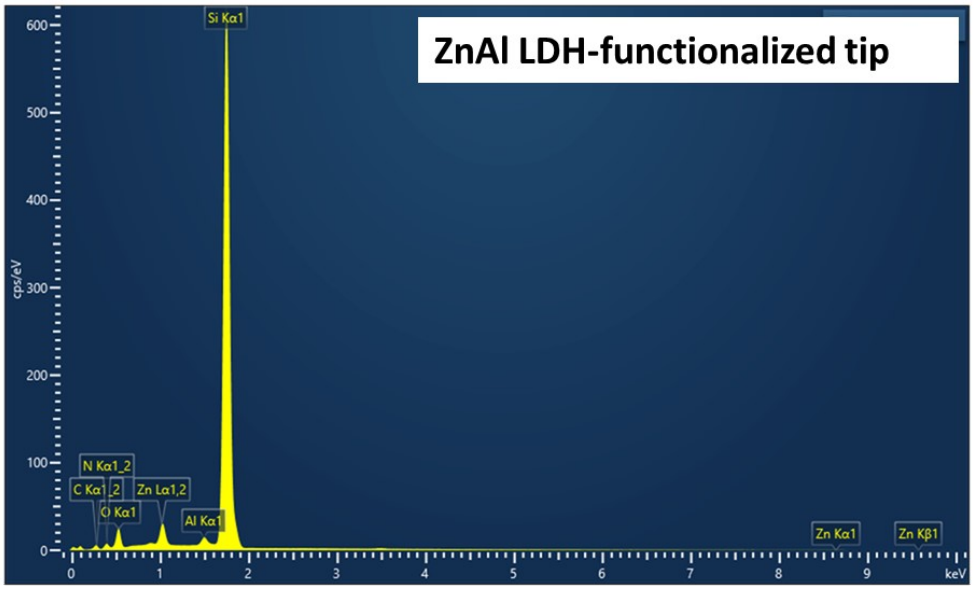


Figure S7. EDS spectra of LDH-functionalized AFM tips performed on the apex. (a) MgAl LDH-functionalized tip. (b) ZnAl LDH-functionalized tip.

The greater nitrogen content in LDH-functionalized tips (**Figure S7**) compared to LDH films grown on silicon wafer (**Figure S6**) is due to the chemical composition of the tips which is made up of silicon nitride materials.

Table S1. M^{II}:Al^{III} molar ratio in LDH films grown on silicon wafers and LDH-functionalized AFM tips.

Sample	M^{II}:Al^{III} determined by EDS analysis
MgAl LDH films grown on silicon wafer	1.99
ZnAl LDH films grown on silicon wafer	2.02
MgAl LDH-functionalized tips	1.97
ZnAl LDH functionalized tips	2.1

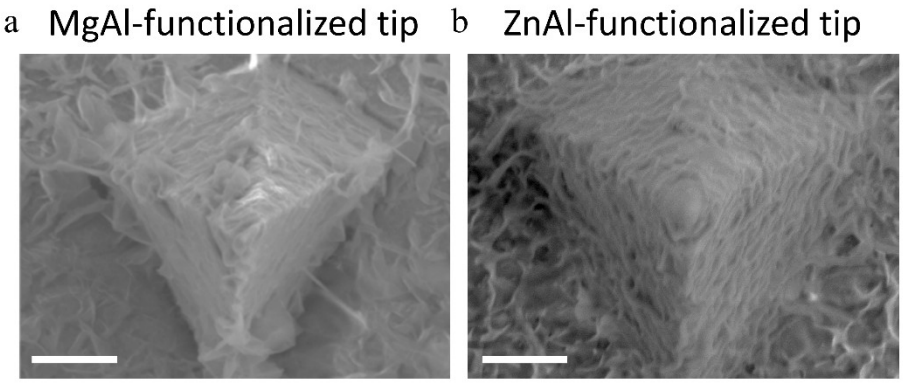


Figure S8. SEM images of LDH functionalized-AFM tips after being used in force measurement experiments (Scale bar = 1 μm). (a) MgAl-functionalized silicon nitride AFM tip. (b) ZnAl-functionalized silicon nitride AFM tip.