Fig. S1. XRD spectra of MAPbI$_{3-x}$Cl$_x$ films exposed to O$_3$ (dark orange) and TMA/O$_3$ (orange).
Fig. S2. In-situ quartz crystal microbalance (QCM) data recorded during 30 cycles of $n\hbar$-$\text{Al}_2\text{O}_3$ ALD.

![Graph showing mass gain (ng/cm²) over time (s) with 4.8 ng/cm² per cycle and 0.12 Å per cycle.](image)
Video S3. Degradation of MAPbI$_3$Cl$_x$ films upon contact with 5 μL water droplet. Unpassivated, 3 nm nh-Al$_2$O$_3$, and 18 nm hb-Al$_2$O$_3$ (left to right).

VIDEO S3
Fig. S4. Degradation of MAPbI$_3$Cl$_x$ films in RH 85% as a function of time. Unpassivated, 3 nm nh-Al$_2$O$_3$, and 18 nm hb-Al$_2$O$_3$ (left to right). a), b), and c) correspond to t = 0, 6, and 48 h, respectively.
Fig. S5. UV-vis spectra of unpassivated MAPbI$_3$Cl$_x$ films in RH 85% as a function of time.
Video S6. Degradation of MAPbI$_{3-x}$Cl$_x$ films upon heating on a hotplate at 250 °C in N$_2$ filled glove box.

VIDEO S6
Fig. S7. FTIR spectra of unpassivated and 18 nm \( h\beta-Al_2O_3 \) passivated MAPbI\(_3\)Cl\(_x\) films before and after annealing at 250 °C in a N\(_2\) filled glove box.
Fig. S8. XRD spectra of unpassivated, 3 nm \textit{nh-}Al_2O_3, and 18 nm \textit{hb-}Al_2O_3 passivated MAPbI_3-xCl_x films after annealing at 250 °C in N_2 filled glove box (t = 70 s).