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Supporting Information

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Enhancing the Photocatalytic Activity by Tailoring an Anodic Aluminum Oxide Photonic Crystal to the Semiconductor Catalyst: At the Example of Iron Oxide

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Figure S1. SEM images of AAO-PhCs produced with a pulse period of $t_{\text{pulse}} = 275$ s. (a) The top-view SEM image indicates the presence of unordered, cylindrical-shaped pores featuring an average diameter of 32 ± 23 nm of the pores at the AAO-PhC surface. (b) The periodic diameter modulation of the pores in depth is shown in cross-section SEM. According to the voltage pulses, the structures' pore diameter is constantly modulated in depth between 15 ± 6 nm and 30 ± 5 nm. Periodicities of these diameter modulations are set by the rectangular current density pulse duration t_{pulse} .

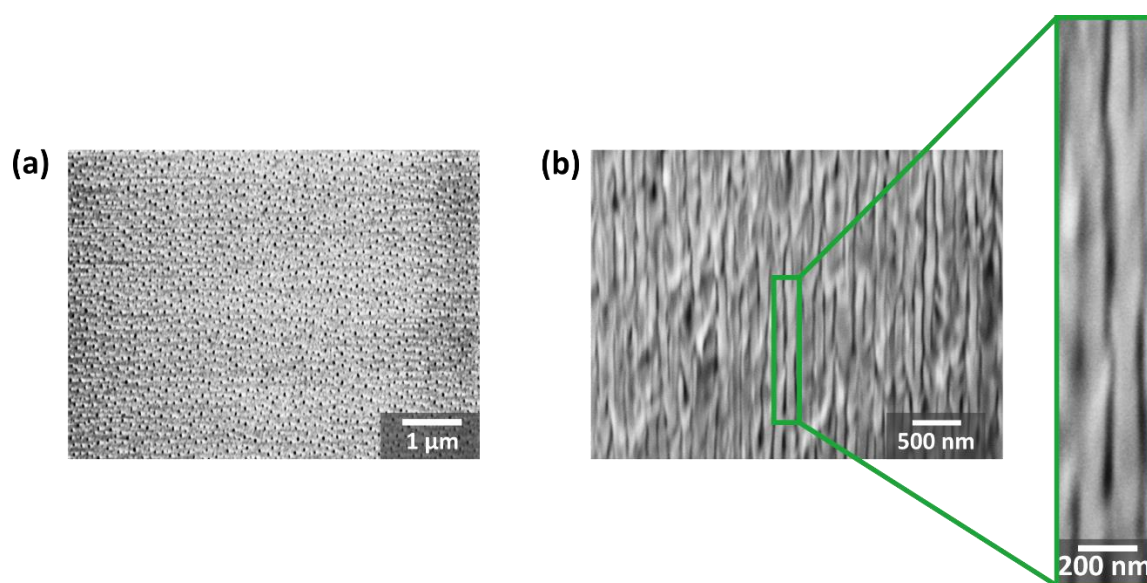


Figure S2. Film thicknesses of Fe_2O_3 and Al_2O_3 layers deposited by ALD were determined by spectral ellipsometry. Note, planar silicon wafers were used as substrates for the ellipsometry measurements. (a) The Fe_2O_3 process is characterized by a growth rate of 0.016 ± 0.003 nm per ALD cycle. (b) The herein used Al_2O_3 deposition process features a growth per cycle of 0.14 ± 0.003 nm.

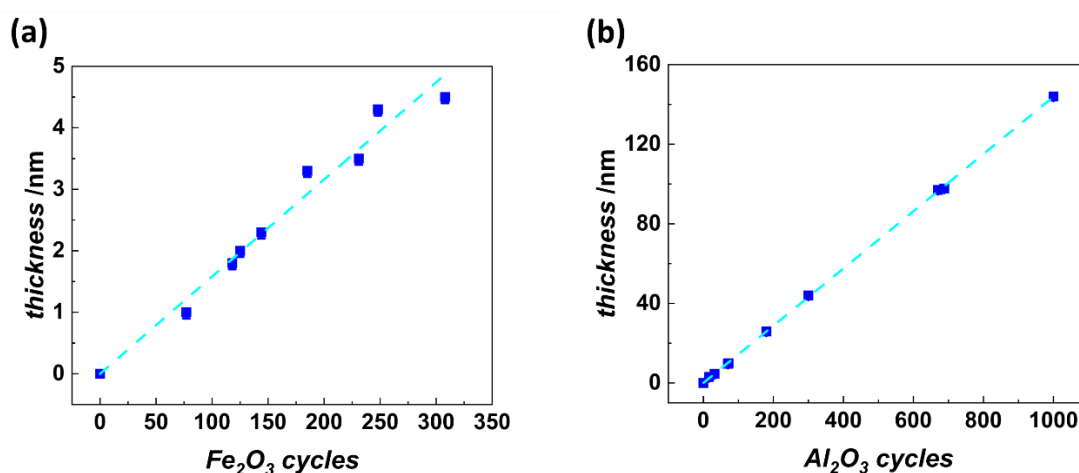


Figure S3. Optical properties of AAO-PhCs anodized by applying different pulse durations and coated with Fe_2O_3 by ALD after production. (a) Reflection spectra of Fe_2O_3 -AAO-PhCs anodized with $t_{\text{pulse}} = 275$ s and coated with different cycles of Fe_2O_3 . (b) Reflection spectra of AAO-PhCs produced with $t_{\text{pulse}} = 275$ s, coated with 385 cycles Fe_2O_3 and subsequently protected by ultra-thin Al_2O_3 coatings by applying different numbers of ALD cycles. (c) Reflection spectra and (d) PSB properties analysis of AAO-PhCs prepared with 270 s pulse duration and functionalized by Fe_2O_3 . (e) Reflection data and (f) PSB

characteristics of samples fabricated with $t_{\text{pulse}} = 335$ s without coating and after coating by 385 cycles Fe_2O_3 and 2 cycles Al_2O_3 .

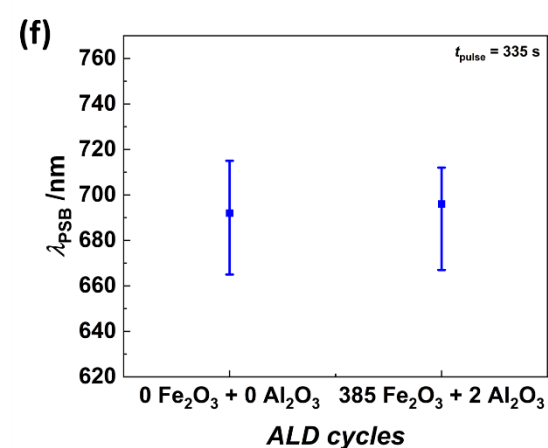
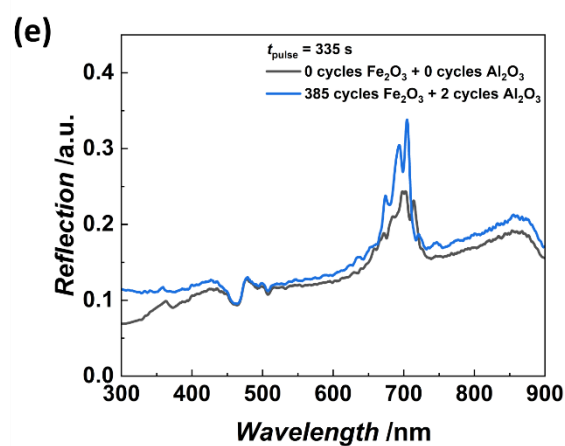
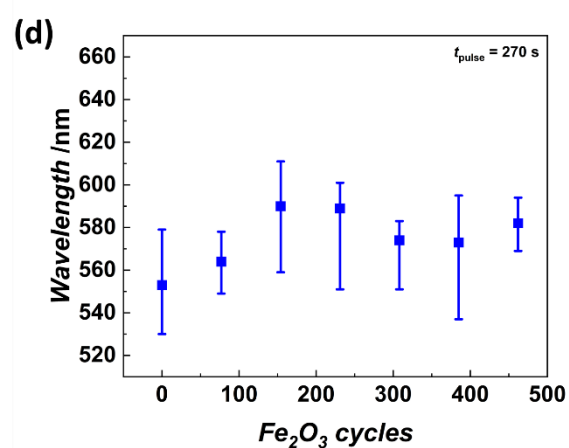
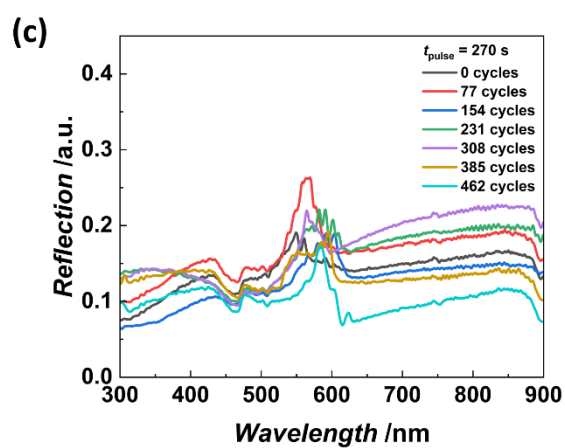
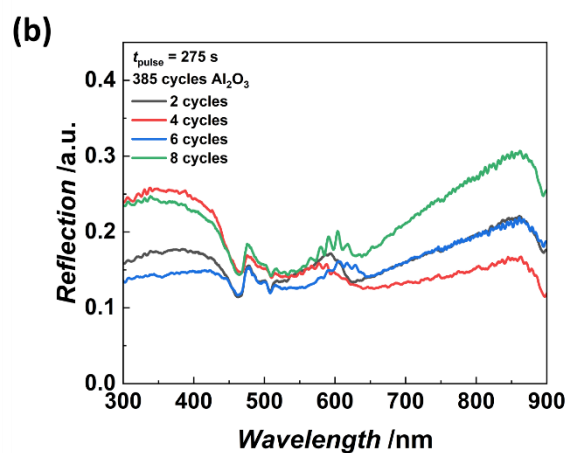
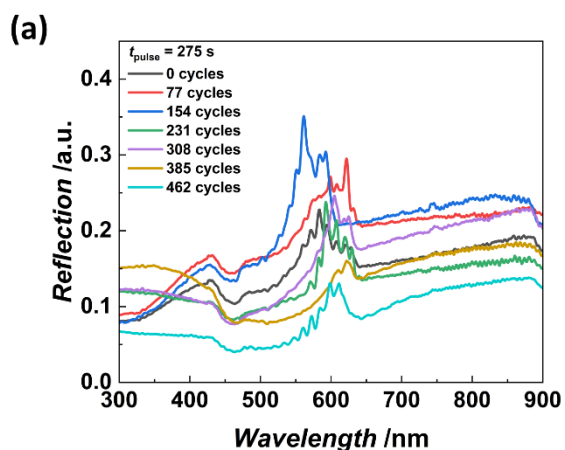


Figure S4. AFM images of Fe_2O_3 films deposited by different ALD cycle numbers corresponding to Table 1. The AFM measurements were done on Fe_2O_3 films of the respective cycle number deposited onto planar silicon wafers. Note, dust particles were excluded from the surface roughness analysis.

