

**Fabrication of Nanoporous Anodized Aluminum Oxide Based Photonic Crystals  
with Multi-band Responses in the vis-NIR Region**

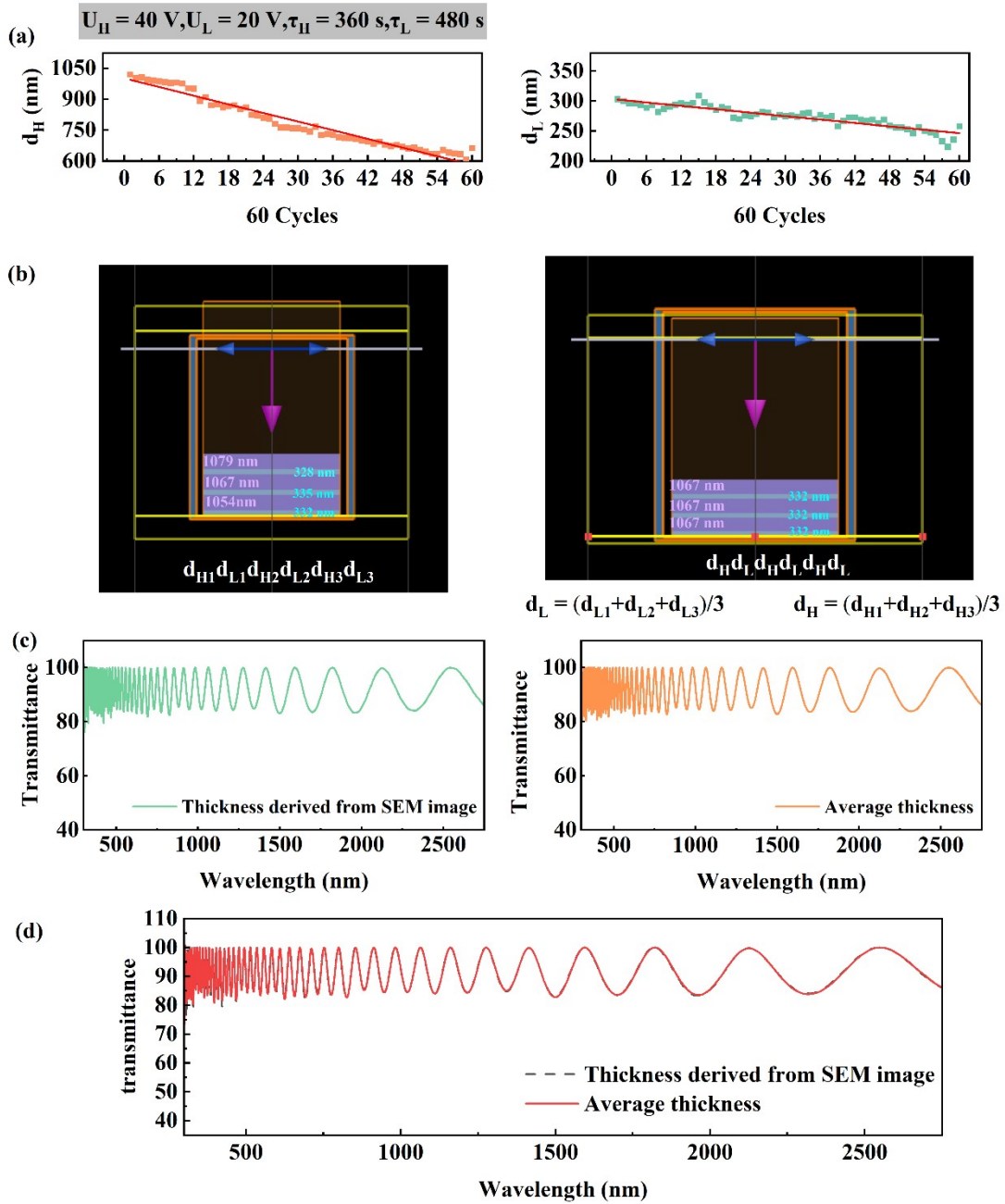
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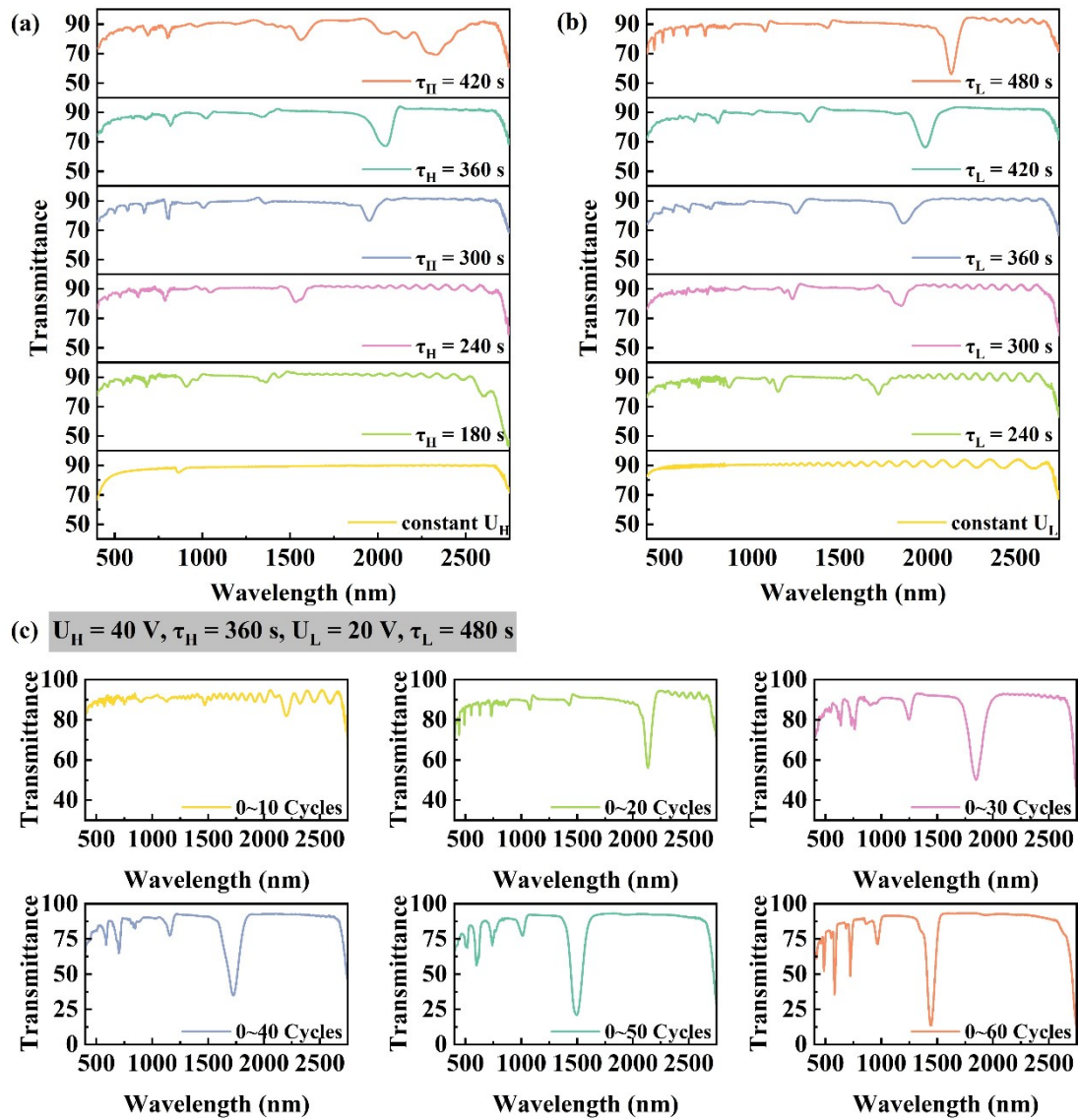
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**Figure S1.** (a) The variation of 60-layer AAO-based PC thickness ( $U_H$  and  $U_L$  layer). (b) FDTD simulation models. The first one includes three cycles of AAO-based PC with varied layer thickness ( $d_{H1}$  &  $d_{L1}$ ,  $d_{H2}$  &  $d_{L2}$ ,  $d_{H3}$  &  $d_{L3}$ ) and the other one includes three cycles of AAO-based PC with the same layer thickness ( $d_H$  &  $d_L$ ), where the  $d_H$  and  $d_L$  are the average value of ( $d_{H1}$ ,  $d_{H2}$ ,  $d_{H3}$ ) and ( $d_{L1}$ ,  $d_{L2}$ ,  $d_{L3}$ ); (c) The transmittance spectra from FDTD models in (b); (d) Consolidated diagram of (c).



**Figure S2.** The entire transmission spectra of AAO-based PC. (a) The AAO-based PC transmission spectra of high voltage duration ( $\tau_H$ ),  $\tau_H = 180$  s,  $240$  s,  $300$  s,  $360$  s,  $420$  s. (b) The AAO-based PC transmission spectra of low voltage duration ( $\tau_L$ ),  $\tau_L = 240$  s,  $300$  s,  $360$  s,  $420$  s,  $480$  s. (c) The AAO-based PC transmission spectra of different cycle numbers,  $N = 10, 20, 30, 40, 50, 60$ .

**Table S1.** Table of structural parameters of AAO-based PC prepared with different high and low pulse durations. Total AAO-based PC thickness ( $d$ ), high and low pore layers thicknesses ( $d_H$ ) ( $d_L$ ), mean ( $d_{Ha}$ ) ( $d_{La}$ ), median ( $d_{Hm}$ ) ( $d_{Lm}$ ), fitted values of the thicknesses of the high and low pore layers ( $d_{Hf}$ ) ( $d_{Lf}$ ), median ( $d_{Hfm}$ ) ( $d_{Lfm}$ ). The first five rows in the Table S1 are the AAO-based PC thickness data when the duration of high voltage 40 V is 180 s, 240 s, 300 s, 360 s, 420 s, respectively (Note:  $U_L=20$  V and constant 480 s,  $N=20$ ); the last five rows in the Table S1 are the AAO-based PC thickness data when the duration of low voltage 20 V is 240 s, 300 s, 360 s, 420 s, 480 s, respectively (Note:  $U_H=40$  V and constant 360 s,  $N=20$ ).

	Anodizing duration /s	$d$ / $\mu\text{m}$	$d_H$ /nm	$d_L$ /nm	( $d_{Ha}$ / $d_{Hm}$ ) /nm	( $d_{La}$ / $d_{Lm}$ ) /nm	$d_{Hf}$ /nm	$d_{Lf}$ /nm	$d_{Hfm}$ /nm	$d_{Lfm}$ /nm
<b>40 V</b>	180	19.2	534~613	306~351	559.1/549.5	331.4/330.5	541.1~601.3	324.9~347.2	551.7	329.4
	240	20.2	577~766	241~353	672.5/674	306.3/304	580.7~758.1	287.4~357.3	674.4	298.8
	300	26.9	820~1033	321~383	947.15/934	356.1/363	902.1~966.3	319.2~380.0	955.2	359.9
	360	29.0	990~1132	329~367	1046.4/1054.5	347.3/344	1003.3~1094.2	335.9~368.7	1045.1	344.4
	420	30.1	955~1467	306~383	1155.3/1121	335.9/331	962.1~1444.0	307.8~381.7	1127.6	330.7
<b>20 V</b>	240	20.8	732~955	133~184	830.2/836	152.2/146.5	735.7~897.6	138.6~189.0	838.0	146.2
	300	22.8	829~1021	167~251	927.9/930	200.2/201	808.0~1001.8	173.8~226.3	941.1	200.3
	360	24.8	875~1029	221~278	939.3/922.5	239.4/236.5	874.1~1038.1	224.5~270.4	929.6	234.6
	420	27.6	977~1103	294~332	1010/994	311.7/311	982.3~1076.5	295.5~322.9	997.8	313.1
	480	29.7	1029~1111	338~368	1054.1/1043.5	350.7/350	1028.2~1086.1	344.0~367.0	1052.2	348.7

**Table S2.** AAO-based PC spectral data table. Photon band gap positions ( $\lambda_1, \lambda_2$ ), transmittance variation ( $\Delta T$ ), half-height width (FWHM) obtained from experiments and simulations of AAO-based PC, as well as the standard deviation (SD) of experimental and simulated data. The first five rows of Table S2 show the AAO-based PC spectral data for high voltage 40 V durations of 180 s, 240 s, 300 s, 360 s, and 420 s, respectively (Note:  $U_L=20$  V,  $N=20$ ); the last five rows of the Table S2 show the AAO-based PC spectral data for low voltage 20 V durations of 240 s, 300 s, 360 s, 420 s, and 480 s, respectively. AAO photonic crystal spectral data (Note:  $U_H=40$  V,  $N=20$ ).

	Anodizing duration /s	$\lambda_1$ /nm	$\lambda_2$ /nm	$\Delta T$	FWHM /nm ( $\lambda_1$ )	$\lambda_1$ /nm (FDTD)	$\lambda_1$ /nm (FDTD)	SD /nm ( $\lambda_1$ )	SD /nm ( $\lambda_2$ )
	180	1359	909	2.29	60.2	1368.1	897.2	6.4	8.4
	240	1532.5	1043.5	2.44	77.7	1502.7	999.1	21.1	31.4
<b>40V</b>	300	1949	1359.5	1.76	67.3	1998.5	1328.4	35.0	22.0
	360	2043.5	1338	1.40	111.8	2136.7	1419.7	65.9	57.7
	420	2328.5	1560.5	1.00	290.1	2235.7	1517.6	65.6	30.3
	240	1719.5	1146.5	2.03	62.1	1492.1	--	160.8	--
	300	1849	1228.5	1.56	86.4	1690.2	1148.2	112.3	56.8
<b>20V</b>	360	1862.5	1249.5	1.18	98.0	1766.2	1199.8	68.3	35.3
	420	1985	1338	0.9	95.5	1981.2	1346.0	2.7	5.6
	480	2134.5	1430.5	1.00	66.8	2153.4	1430.7	13.4	0.2

**Table S3.** AAO-based PC layer thickness variation with the number of cycles. Total AAO-based PC thickness ( $d$ ), high and low pore layer thicknesses ( $d_H$ ,  $d_L$ ), mean high and low pore layer thicknesses ( $d_{Ha}$ ,  $d_{La}$ ), intermediate values ( $d_{Hm}$ ,  $d_{Lm}$ ), fitted values ( $d_{Hf}$ ,  $d_{Lf}$ ), fitted intermediate values ( $d_{Hfm}$ ,  $d_{Lfm}$ ), and fitted intermediate values ( $d_{Hfm}$ ,  $d_{Lfm}$ ). Note:  $U_H = 40$  V,  $U_L = 20$  V.

Anodizing Periods	$d / \mu\text{m}$	$d_H / \text{nm}$	$d_L / \text{nm}$	$(d_{Ha} / d_{Hm}) / \text{nm}$	$(d_{La} / d_{Lm}) / \text{nm}$	$d_{Hf} / \text{nm}$	$d_{Lf} / \text{nm}$	$d_{Hfm} / \text{nm}$	$d_{Lfm} / \text{nm}$
10	14.0	946~1093	290~350	1019.5/1026	320.6/325	936.5~1103	314.2~351.4	1019.3	314.4
20	29.7	1029~1111	338~368	1054.1/1043.5	350.7/350	1028.2~1086.1	344.0~367.0	1052.2	348.7
30	37.9	745~1087	255~344	919.5/908.5	297.5/297.5	780.8~1079.7	271.1~335.5	913.6	294.4
40	44.7	640~963	238~314	805.6/786.5	282.6/285	676.6~932.6	257.6~306.6	806.2	282.8
50	52.3	643~930	231~290	756.1/749	264.1/268.5	662.7~917.3	238.5~284.3	738.2	265.5
60	57.6	659~990	230~309	785.9/747	280.8/284.5	684.7~1004.7	248.1~293.7	754.7	286.4

**Table S4.** Table of experimentally measured AAO-based PC spectral data. Photonic band gap positions ( $\lambda_1$ ,  $\lambda_2$ ), transmittance ( $\Delta T$ ), and half-height width (FWHM) were obtained from experiments and simulations of AAO-based PC, as well as the standard deviation (SD) of experimental and simulated data. The number of anodizing cycles was varied, at which time  $U_H = 40$  V duration of 360 s and  $U_L = 20$  V duration of 480 s.

Anodizing Periods	$\lambda_1/\text{nm}$	$\lambda_2/\text{nm}$	$\Delta T$	FWHM/nm ( $\lambda_1$ )	FWHM/nm ( $\lambda_2$ )	$\lambda_1/\text{nm}$ (FDTD)	$\lambda_2/\text{nm}$ (FDTD)	SD/nm ( $\lambda_1$ )	SD/nm ( $\lambda_2$ )
10	2198.5	1470.5	1.00	65.57	29.0	2180.8	1441.2	8.9	20.7
20	2134.5	1430.5	2.43	66.8	43.9	2158.5	1430.7	17.0	0.2
30	1846.5	1247.0	2.76	128.9	57.6	1946.2	1238.1	70.5	6.3
40	1725.5	1158.0	3.60	127.8	49.4	1654.6	1107.0	50.2	36.0
50	1495.0	1012.0	4.36	114.8	53.3	1551.0	1037.7	39.6	18.2
60	1443.5	965.0	4.79	76.8	40.2	1459.6	976.2	11.4	7.9