CapSole

Environmental Protection Testing Report Spring 2022

Summary

CapSole wishes to test the ability of its 1st generation shoe protector bag to protect against the discoloration of the materials of construction of shoes as well as the eventual breakdown of adhesive components of those articles. Testing was done under extreme conditions and xenon arc exposure to test the maximum limits of the product to protect against environmental conditions following cycle 12 conditions of ASTM G155-21 for 400 hours. One Nike AirForce1 was placed in a protective bag with the other shoe outside of the bag for the duration of the exposure. Testing shows that the Capsole bag protector was able to prevent discoloration by at least half of the magnitude of change caused by open exposure.

Samples tested

Nike AF1 in new condition

Test Equipment Employed

Description	Calibration Due Date
Spectrophotometer	9 July 2022
Chamber,QSUN	11 October 2022
Clock,Wall	18 November 2022
Radiometer	13 January 2023

Image of the test samples ready to be inserted into the test chamber.

Test Method Employed

ASTM G155, cycle 12

Daylight conditions 35w/(m^2 · nm) @ 340 nm with 18 hours in light and 6 hours in dark for 100 hour cycles - with atmospheric conditions shown in the table below.

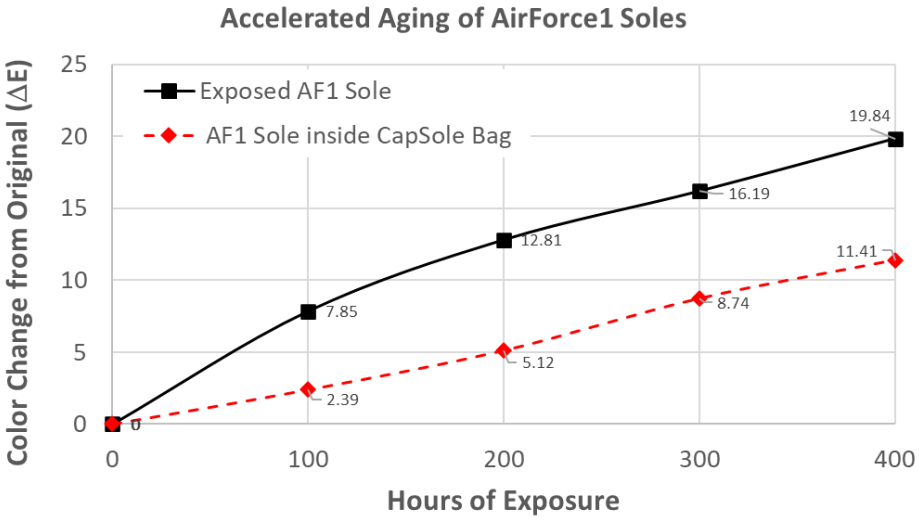
Cycle	Filter	Irradiance and Wavelength	Exposure Cycle	Black Panel Temperature (BPT) (°C)	Relative Humidity (RH) (%)	Chamber Air Temperature (CAT) (°C)
1	Daylight	0.35 W/(m²· nm) @ 340 nm	102 min light	63	50[A]	44[A]
			18 min light and water spray[B]	Uncontrolled		44[A]
2	Daylight	0.35 W/(m²· nm) @ 340 nm	102 min light[C]	63	50[A]	44[A]
			18 min light and water spray[B,C]	Uncontrolled		44[A]
			6 h dark[D]	24[E]	95	24[A]
3	Daylight	0.35 W/(m²· nm) @ 340 nm	90 min light	77	70	63[A]
			30 min light and water spray[B]	Uncontrolled		63[A]
4	Window Glass	0.30 W/(m²· nm) @ 340 nm	Continuous light	55	55	45[A]
5	Window Glass	1.10 W/(m²· nm) @ 420 nm	102 min light	63	35	47[A]
			18 min light and water spray[B]	Uncontrolled		47[A]
6	Window Glass	1.10 W/(m²· nm) @ 420 nm	228 min light	63	35	47[A]
			60 min dark[D]	43	90	43[A]
7	Extended UV	0.55 W/(m²·nm) @ 340 nm	40 min light	70	50	47
			20 min light and water spray (front)[B]	Uncontrolled		47
			60 min light	70	50	47
			60 min dark and water spray (front and back)[D]	38	95	38
7A	Daylight (Type II)	0.55 W/(m²·nm) @ 340 nm	40 min light	70	50	47
			20 min light and water spray (front)[B]	Uncontrolled		47
			60 min light	70	50	47
			60 min dark and water spray (front and back)[D]	38	95	38
8	Extended UV	0.55 W/(m²·nm) @ 340 nm	228 min light	89	50	52
			60 min dark[D]	38	95	38
9	Daylight	180 W/m² @ 300 - 400 nm	102 min light	63	50	28[A]
			18 min light and water spray[B]	Uncontrolled		28[A]
10	Window Glass	162 W/m² @ 300 - 400 nm	Continuous Light	89	50	Uncontrolled
11	Window Glass	1.5 W/(m²· nm) @ 420 nm	Continuous Light	63	50	43[A]
12	Daylight	0.35 W/(m²· nm) @ 340 nm	18 hrs light	63	30	47[A]
			6 hrs dark[D]	35	90	35[A]
13	Daylight (Type I)	0.40 and 0.80 W/(m²· nm) @ 340 nm	See Note X3.4			

Raw Data Table

Sample I.D.	Interval (Hours)	L*	a*	b*	DL*	Da*	Db*	DE*
Open AF1 Sole	0	90.03	-0.01	-1.05				
	100	89.31	-1.38	6.64	-0.72 D	-1.37 G	7.70 Y	7.85
	200	88.28	-1.49	11.55	-1.75 D	-1.48 G	12.60 Y	12.81
	300	86.44	-1.06	14.70	-3.59 D	-1.05 G	15.75 Y	16.19
	400	85.98	-0.31	18.36	-4.05 D	-0.30 G	19.41 Y	19.84
Bagged AF1 Sole	0	89.72	0.06	-0.70				
	100	89.39	0.18	1.67	-0.33 D	0.12 R	2.37 Y	2.39
	200	89.49	0.35	4.41	-0.23 D	0.30 R	5.11 Y	5.12
	300	88.47	0.42	7.94	-1.25 D	0.36 R	8.64 Y	8.74
	400	86.19	0.40	10.14	-3.53 D	0.35 R	10.84 Y	11.41

Exposure (hours)	AF1 Sole CapSole Color Change from Original (ΔE)	AF1 Sole Exposed Color Change from Original (ΔE)
0	--	--
100	2.39	7.85
200	5.12	12.81
300	8.74	16.19
400	11.41	19.84

Data Visualization



Exposure = cycles of high temperature, humidity, and direct UV light

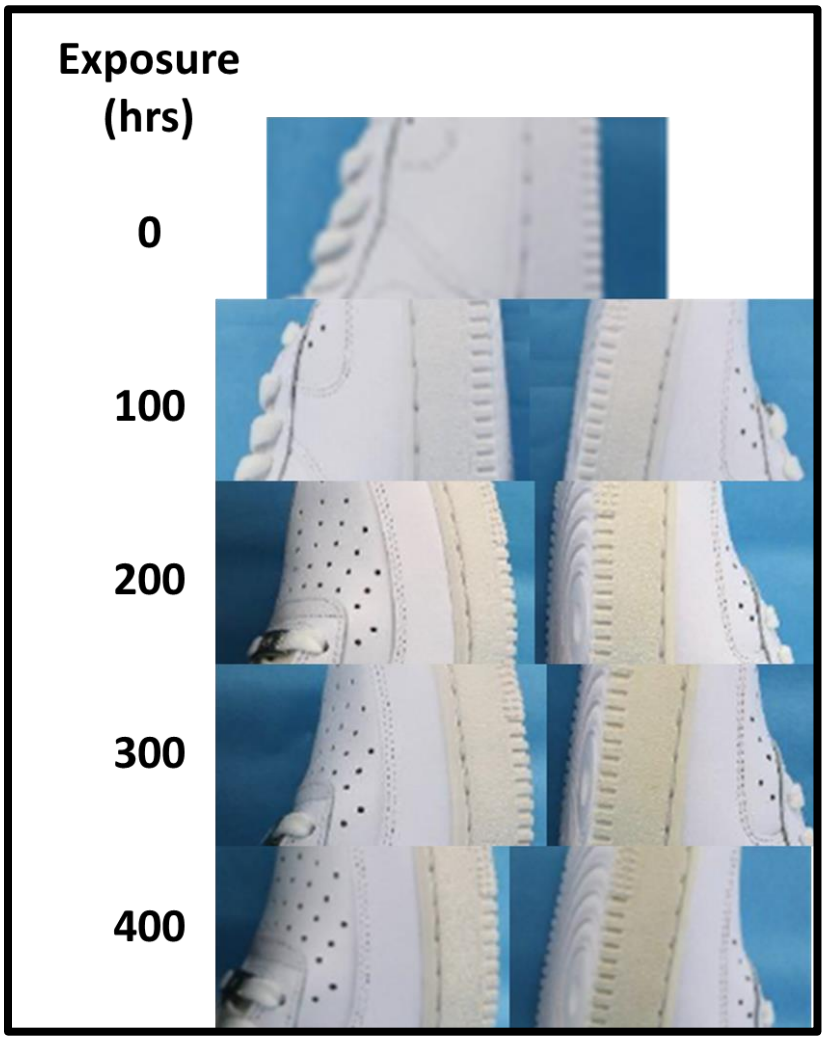
Data Interpretation

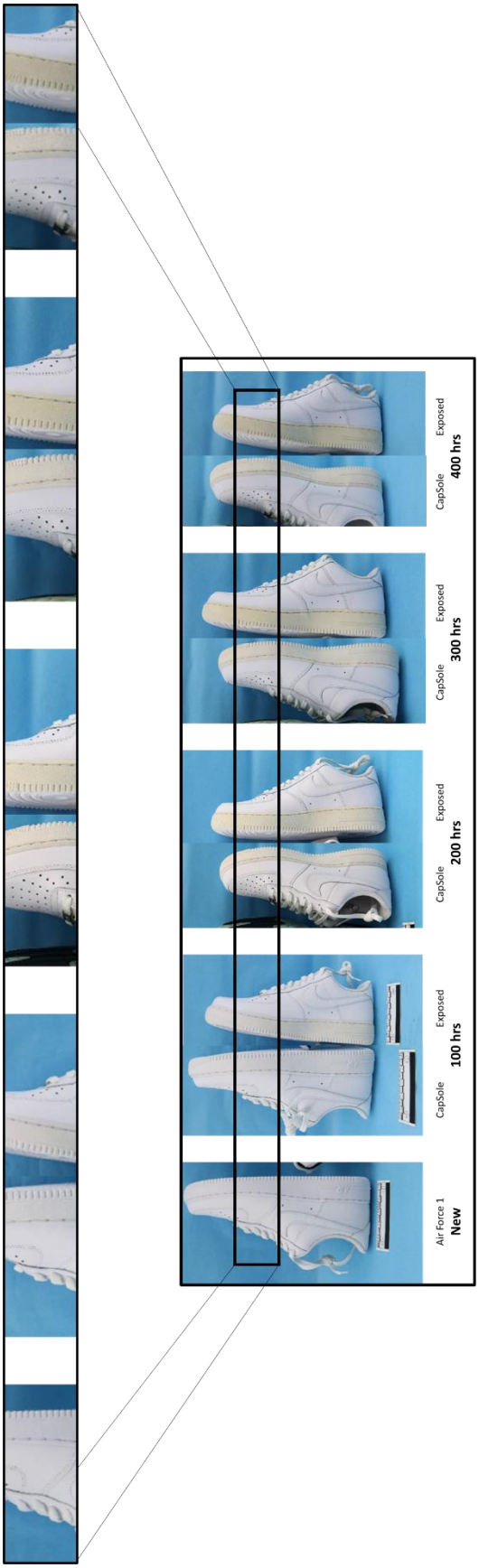
L*, a*, and b* are axes on a radial color scale wherein L* represents darkness to lightness, a* represents greenness to redness, and b* represents blueness to yellowness. ΔE is a composite calculation of these vectors that represents the deviation of a color from its target color coordinates. In this case, the greater the ΔE value, the farther away is the color of the sample from its original color.

Referring to the plot above, one can see that at each of the 100 hr intervals where color measurements were taken, the deviation of the color from the new state for the exposed shoes vs. the CapSole protected shoe was ~2x or worse (1.7x – 3.2x).

This demonstrates a reduced level of polymer degradation for the shoes protected by the CapSole bag, as represented by the degree of discoloration or yellowing of the soles of the shoe.

Sample Images




Air Force 1
New
CapSole
Exposed
100 hrs
CapSole
Exposed
200 hrs
CapSole
Exposed
300 hrs
CapSole
Exposed
400 hrs