

Supporting Information

Atmospheric Pressure Plasma Treatment of Magnesium Alloy for Enhanced Coating Adhesion and Corrosion Resistance

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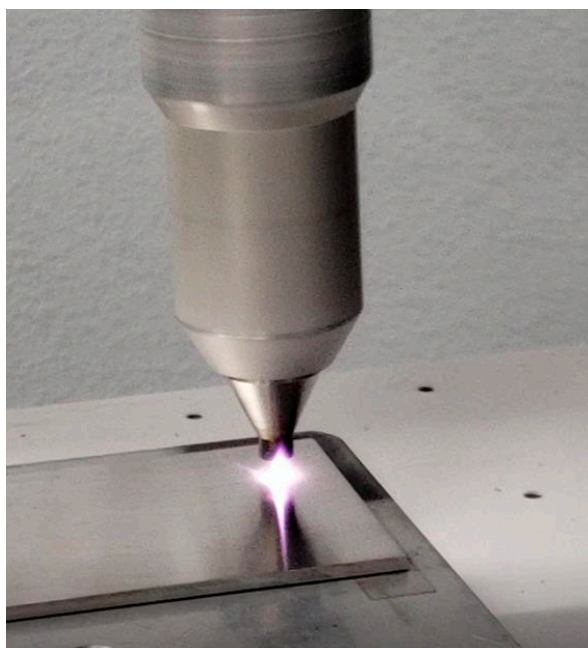
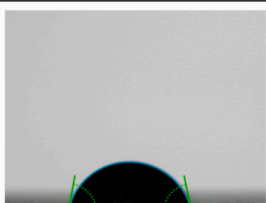
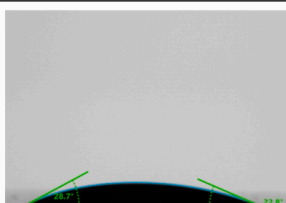
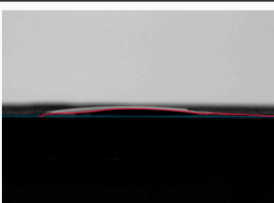
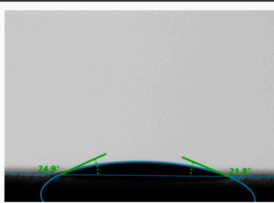


Figure S1. Atmospheric-pressure N₂ plasma treatment on AZ91D (7.6 cm × 10.2 cm, 0.3 cm thick).

Table S1. Water contact angle measurement on CO₂ and Air AP-treated AZ91D surfaces.

AS-IS	Fresh 600 grit	CO ₂ -AP	Air-AP
82.3 ± 6.3° (n=8)	32.5 ± 7.3° (n=8)	Not measurable (<10°)	19.5 ± 8.3° (n=8)
			

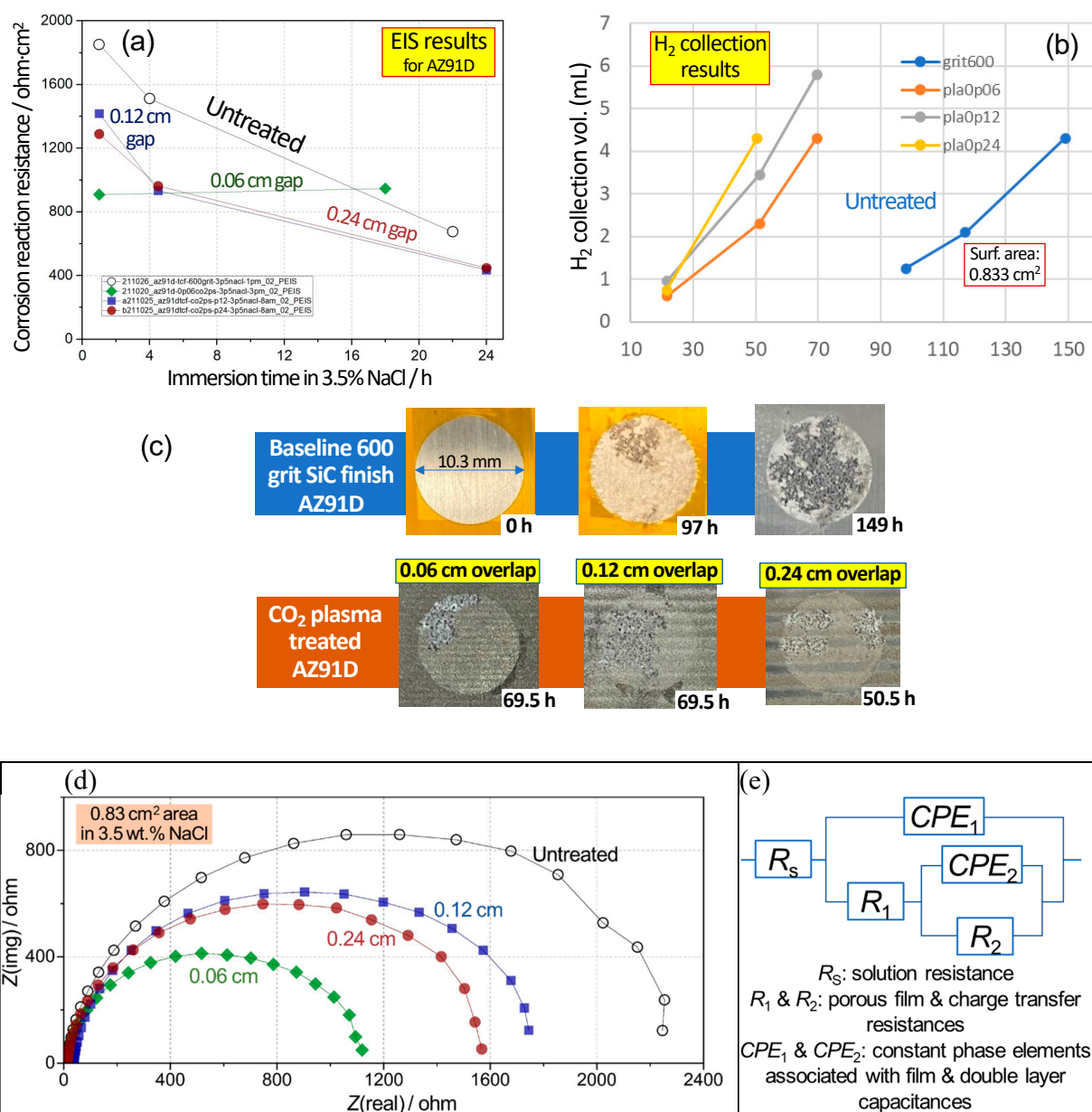


Figure S2. (a) Corrosion reaction resistance of CO₂ AP-treated AZ91D and untreated surfaces over time in 3.5% NaCl. (b) Hydrogen collection of CO₂_AP-treated vs. untreated AZ91D surfaces (c) corresponding photo images of samples after hydrogen collection. (d) Nyquist impedance spectra of untreated and CO₂ AP-treated AZ91D with 3 different spacings after 1 h immersion. The lowest frequency is 1.3 Hz for the impedance spectra. Note that the impedance spectra at frequencies < 1.3 Hz were noisy, so they were not used for the impedance data fitting. (e) equivalent circuit used to fit the impedance data. The corrosion reaction resistance was determined from the sum of R_1 and R_2 . The chi-square values of all fitting were lower than 0.002, indicating sufficient quality of data fitting.

Table S2. process parameters of N₂ AP treatment.

Process	Distance (mm)	Speed (mm/s)	Gas Flow Rate (L/min)	Power (W)
1	4	25	33	523
2	4	10	33	516
3	4	5	33	511
4	4	1	33	510
5	4	3	33	515
6	4	3	33	547
7	4	10	33	608
8	4	10	45	640
9	8	10	45	643

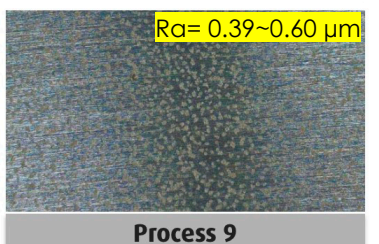
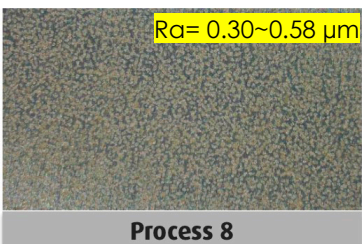
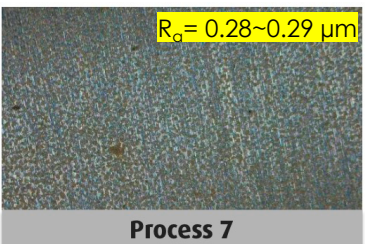
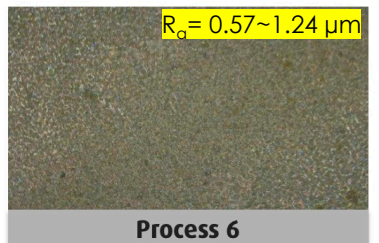
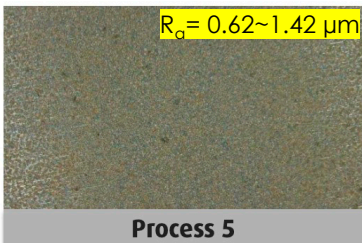
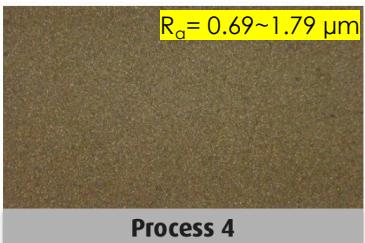
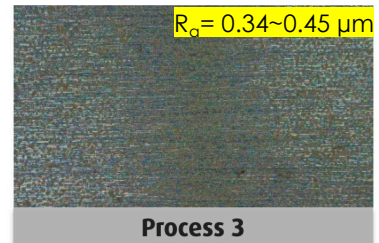
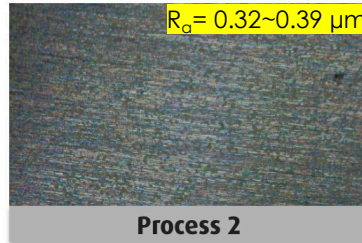
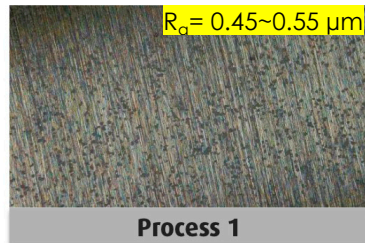


Figure S3. Optical microscopic images of AZ91D treated with one time swing of N₂ AP treatment with various operation parameters, corresponding to the Table S2.

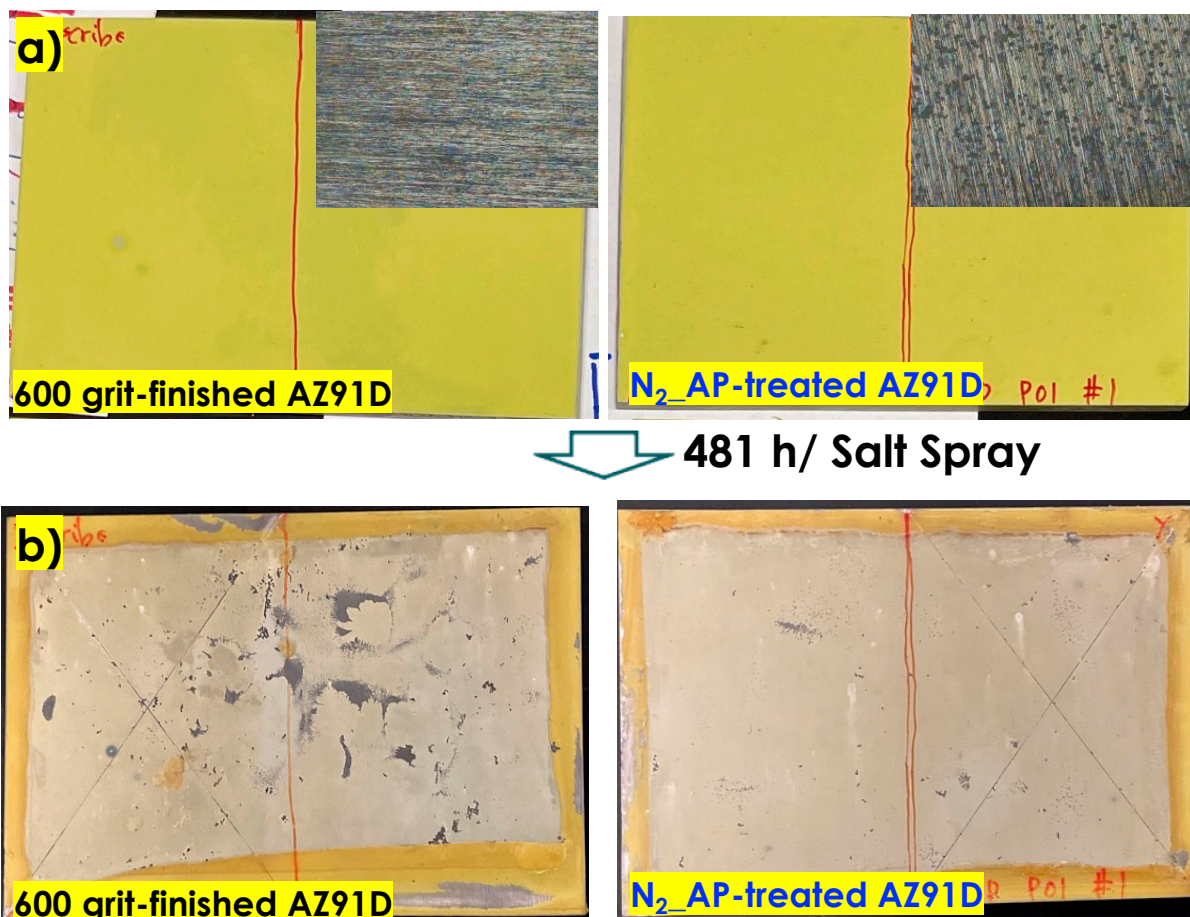


Figure S4. Scalable MIL 23377 primer-coated AZ91D sheet samples (7.6 cm × 10.2 cm × 0.2 cm) after 481 hours in a salt spray chamber. Inset photos are 600 grit finished AZ91D and N₂ AP-treated AZ91D with the operation parameter of process 1.