

Figure S1. The schematic of dielectric barrier discharge for surface treatment of metals.

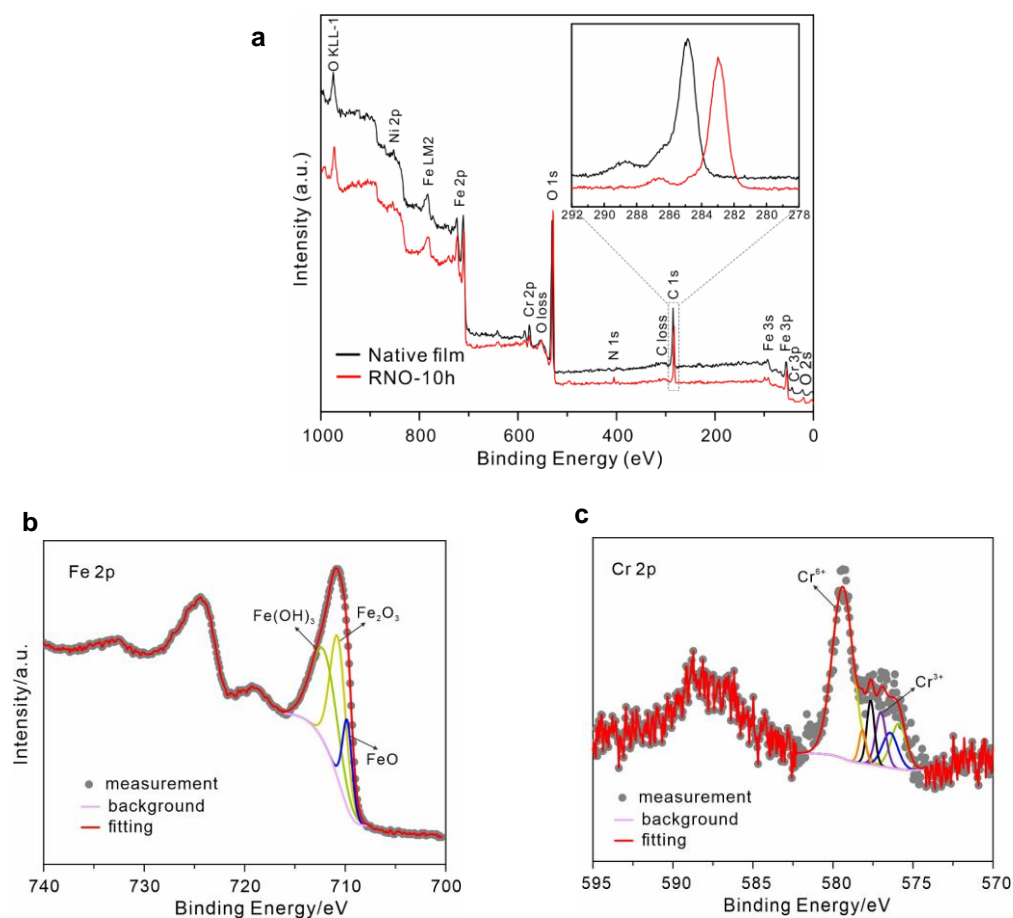


Figure S2. (a) XPS survey spectra of 316L SS and the RNO-10h 316L SS. The inset spectra of C 1s showed the negative shift of 1.9 eV for the whole spectra of RNO-10h 316L SS. It was indicated that the surface was negatively charged. **(b)**, The RNO-10h sample was calibrated by standard C 1s, and the fitting results of Fe 2p_{3/2} spectrum indicated that the film consisted of Fe(OH)₃, Fe₂O₃ and FeO. **(c)**, The Cr 2p_{3/2} spectrum was fitted using one peak at 579 eV for Cr⁶⁺, and a series of five peaks for Cr³⁺ owing to multiplet splitting. The metallic Cr and Fe have disappeared. [13,15].

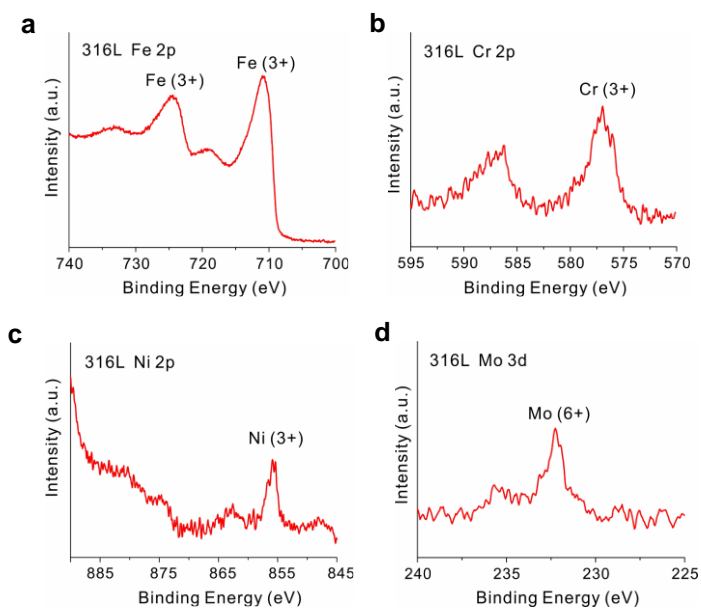


Figure S3. XPS spectra of the RNO-10h after 3 d of immersion in 0.6 M NaCl solution at room temperature. **(a)**, Fe^{3+} did not change during the immersion. **(b)**, Cr^{6+} had been reduced to Cr^{3+} . **(c)**, Ni^{3+} in film did not change during the immersion. **(d)**, Mo^{6+} did not change during the immersion.

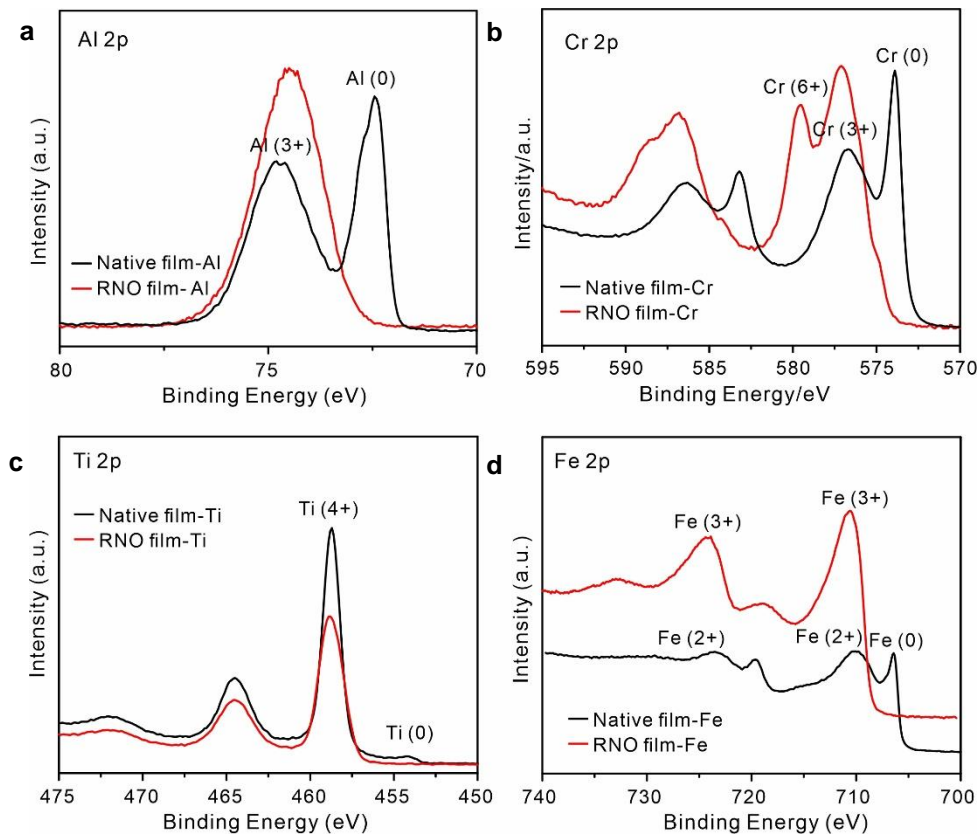


Figure S4. XPS spectra of pure metal surfaces before (black) and after (red) 1 h of processing, indicating the generality of the processing in metal surface oxidation. (a), the disappearing of metallic Al indicates the thickening of the oxide film. (b), the disappearing of metallic Cr indicates the thickening of the oxide film on Cr. (c), the disappearing of metallic Ti indicates the thickening of the oxide film on Ti. (d), the disappearing of metallic Fe indicates the thickening of the oxide film on Fe.

Table 1. EIS parameters extracted by fitting EIS spectra (Figure 3d).

Samples	R_s ($\Omega \cdot \text{cm}^2$)	C_f ($10^{-5} \cdot \Omega^{-1} \cdot \text{s}^{-n_1} \cdot \text{cm}^{-2}$)	n_1	R_f ($10^5 \cdot \Omega \cdot \text{cm}^2$)	C_{dl} ($10^{-5} \cdot \Omega^{-1} \cdot \text{s}^{-n_2} \cdot \text{cm}^{-2}$)	n_2	R_{ct} ($10^5 \cdot \Omega \cdot \text{cm}^2$)
Bare 316L SS	2.32	—	—	—	6.24	0.91	2.06
RNO-10 min	2.69	—	—	—	2.81	0.89	32.5
RNO-1h	3.17	0.83	0.84	70.1	0.62	0.72	0.029
RNO-10h	5.47	0.85	0.85	48.6	0.35	0.64	1.77

References

- [13] Greczynski, G.; Hultman, L. X-ray photoelectron spectroscopy: Towards reliable binding energy referencing. *Prog. Mater. Sci.* 2020, 107, 100591.
- [15] Wang Z.; Di-Franco Francesco.; Seyeux A.; Zanna S.; Maurice V.; Marcus P. Passivation-induced physicochemical alterations of the native surface oxide film on 316L austenitic stainless steel, *J. Electrochem. Soc.* **2019**, 166, C3376–C3388.