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Supplementary Materials: Ultrasound-Auxiliary Preparation of Antifouling Cu-Enriched Titanium Oxide Ceramic Layer

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1. Supplementary materials and methods

The phase component of MAO specimens was detected by TF-XRD (Thin film X-ray diffraction, XtaLAB PRO MM007HF, Rigaku, Tokyo, Japan) at a scanning speed of 1° min^{-1} from 20 ° to 80 ° with an incident angle of 0.8 °. The surface and cross section morphologies of samples were examined using a field emission scanning electron microscope (SEM, Gemini 300, Zeiss, Oberkochen, Germany). Water contact angles (CAs) of both coatings were measured using an optical contact angle instrument (JC2000D, Powereach, Shanghai, China).

Electrochemical measurement was conducted in a 3.5 wt. % NaCl solution with a traditional three-electrode configuration. During the electrochemical measurement, the temperature was maintained at ambient temperature. All coatings were sealed by epoxy resin to ensure only 1 cm^2 surface area exposed to the testing solution. Electrochemical impedance spectrum (EIS) was obtained by the same configuration, with the frequency ranging from 0.01 to 10^5 Hz. And electrochemical polarization was conducted after the stabilization of open circuit potential (OCP), which scanned from -200 mV (vs. OCP) to +200 mV (vs. OCP) at the rate of 0.5 mV/s.

The SRB seed was isolated from Shengli Oilfield (Shandong province, China), which was identified as *Desulfotomaculum nigrificans*. The SRB was cultivated in the culture medium containing 0.01 g/L K_2HPO_4, 0.2 g/L $MgSO_4$, 0.2 g/L $(NH4)_2Fe(SO_4)_2$, 10 g/L NaCl, 1 g/L yeast extract, 0.1 g/L vitamin C, 4 g/L sodium lactate with its pH adjusted to 7.0-7.2 using NaOH. The culture medium was sterilized in an autoclave for 20 min at 121 °C and the specimens were sanitized under a 30 W ultraviolet light bulb for 30 min. To remove dissolved oxygen, the culture medium was then sparged with CO_2 for 4 hours. The incubation of SRB was conducted at 37 °C for 14 days. Afterwards, all the specimens were gently rinsed using phosphate buffer solution (PBS, macklin, China), which were then placed in a 2.5% (v/v) glutaraldehyde for 8 hours and then dehydrated using a series of ethanol solutions (20%, 50%, 70%, 90%, 99% by volume) prior to the examination using SEM.

2. Supplementary results

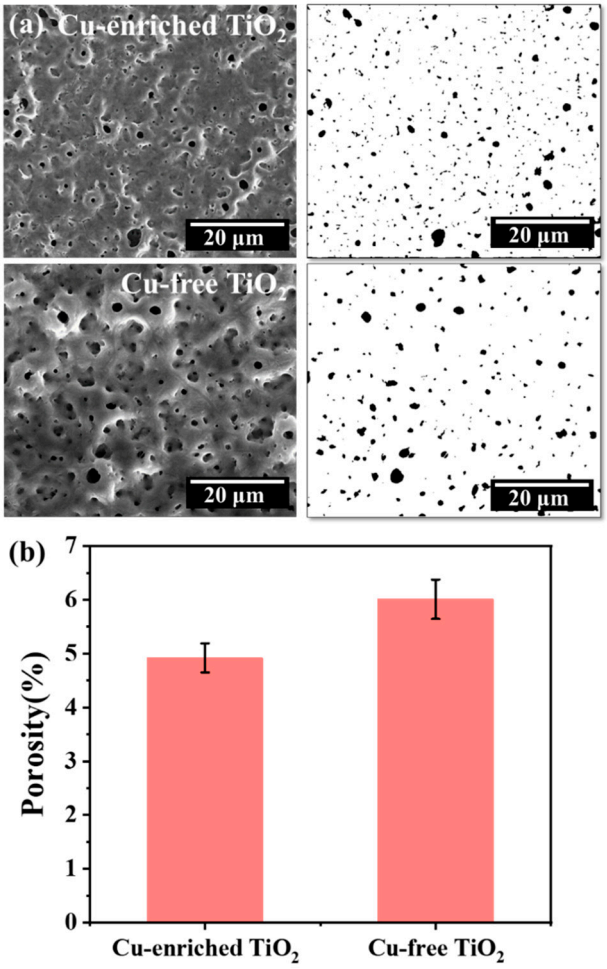

Figure S1. (a) SEM micrographs along with the binary images based on standard threshold segmentation method; (b) statistic result of porosity.

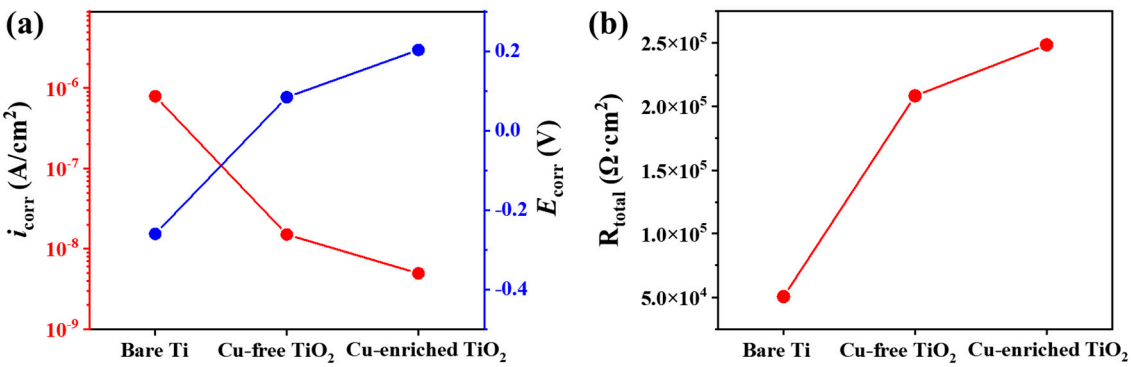

Figure S2. (a) statistic result of i_{corr} and E_{corr}; (b) statistic result of total resistance (R_{total}=R_{coat}+R_{ct}).

Table S1. Porosity of Ti-based Cu modified micro-arc oxidation coatings.

Substrate	Cu source	Parameter	Porosity	Ref
CP-Ti	$Cu(CH_3COO)_2$	100 mA/cm^2, 10 min	~17.12%	[1]
TC4	$Cu_2P_2O_7$	450 V, 800 Hz, 15 min	~9.38%	[2]
Ti6Al4V	Na_2CuY	100 mA/cm^2, 3 min	~5.62%	[3]
TC4	$CuSO_4$	450 V, 15 min	~10.13%	[4]
TA2	$[Cu(NH_3)_4]^{2+}$	1 A/cm^2, 10 min	~11.02%	[5]
TA2	Na_2Cu-EDTA	100 mA/cm^2, 10 min	~4.92%	This work

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