coatings

Supplementary Materials: Effect of Ultrasonic Vibration on Microstructure and Antifouling Capability of Cu-Modified TiO_2 Coating Produced by Micro-Arc Oxidation

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Supplementary materials and methods

Photographs for TC-stir and TC-ultra were obtained using a digital camera. The sur face and cross sectional morphologies of TC-stir and TC-ultra were observed using a field emission scanning electron microscope (SEM, FEI Nova 450, FEI, FEI, Hillsboro, OR, USA) with the application of electron probe X-ray micro-analyzer (EPMA, Shimadzu 8050G, Rigaku, Tokyo, Japan) to detect the elemental compositions.

The phase component of MAO specimens was detected by TF-XRD (Thin film X-ray diffraction, XtaLAB PRO MM007HF, Rigaku, Tokyo,) at a scanning speed of 1° min^{-1} with an incident angle of 0.8 °. 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, city, 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) before the examination using SEM.

Supplementary result

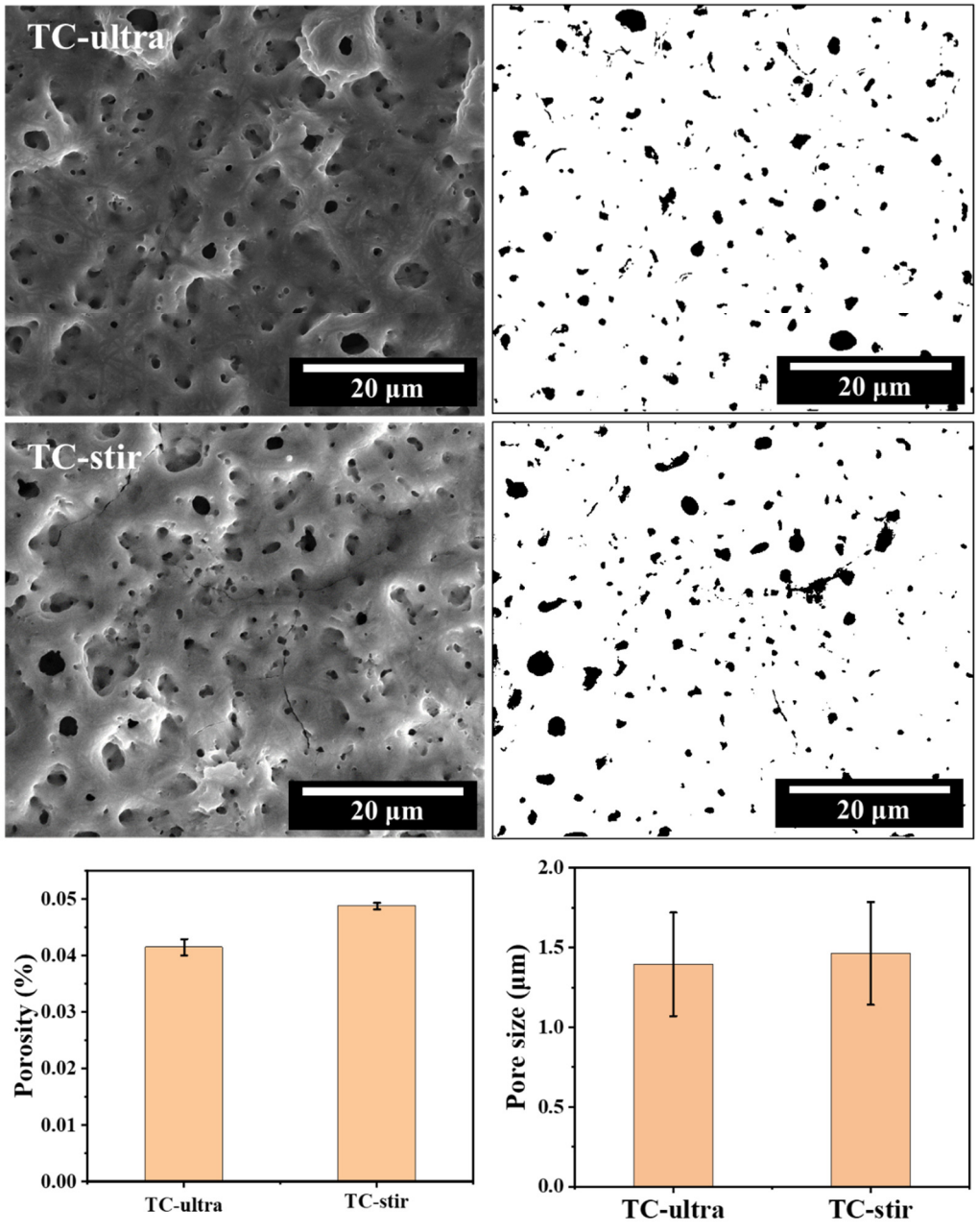

Figure S1. Porosity analysis of both Cu-modified TiO_2 coatings.