# Supplementary Material

# Rapid structural regulation, apatite inducing mechanism and *in vivo* investigation of the microwave hydrothermally treated titania coating

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## Wettability, Surface energy and Zeta potential

Surface wetting angles of the DI water and ethylene glycol n the Ti, MAO, MAOMH001, MAOMH05 and MAOMH3 samples were evaluated by using a goniometer (CAM100, KSV, Helsinki, Finland) equipped with a digital camera and analysis software. The surface energies of the Ti, MAO, MAOMH001, MAOMH05 and MAOMH3 samples were calculated according to Young's equation [1], and the detailed information about the measurement for the surface energy had been reported in our study [2].

The measurement for the surface zeta potentials of the sample were performed by using a streaming current electrokinetic analyzer (SurPass, Anton Paar GmbH, Graz, Austria). The zeta potentials were calculated according to the Helmholtz-Smoluchowski approach, and a 1 mM KCl solution was acted as the background electrolyte solution.

## Results

Fig.S1 shows the surface wettability of the Ti, MAO, MAOMH001, MAOMH05 and MAOMH3 coatings. The wetting angle and spreading situation on the MAO coating were obviously optimized,

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#Lin Chen and Junyu Ren are equal to this work.

while those on the MAOMH001, MAOMH05 and MAOMH3 coatings were greatly improved and decreased to nearly 10 ° when water was used. Moreover, the MH treated MAO coatings had higher surface energy than MAO coating as shown in Fig.S2. Meanwhile, the MH treated MAO coatings had negatively charged surface as shown in Fig.S3.

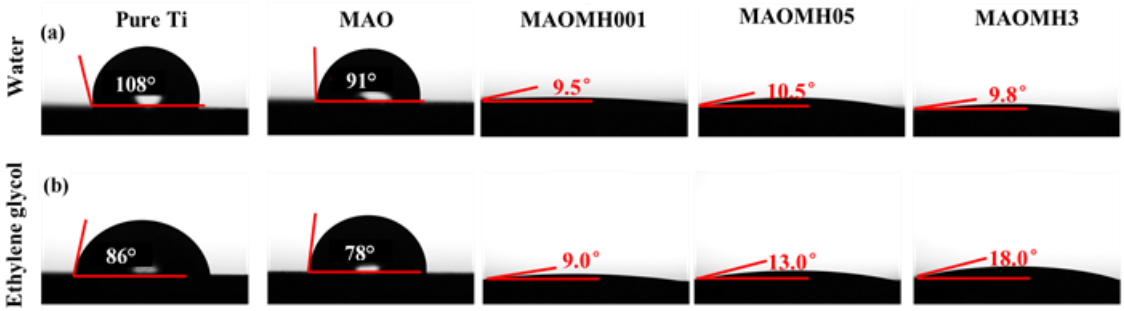


Fig.S1 The contact angles of the water and ethylene glycol on the Ti, MAO, MAOMH001, MAOMH05 and MAOMH3 samples: (a) the surface wettability of the Ti, MAO, MAOMH001, MAOMH05 and MAOMH3 samples when the water was used, (b) the surface wettability of the Ti, MAO, MAOMH001, MAOMH05 and MAOMH3 samples when the ethylene glycol was used.

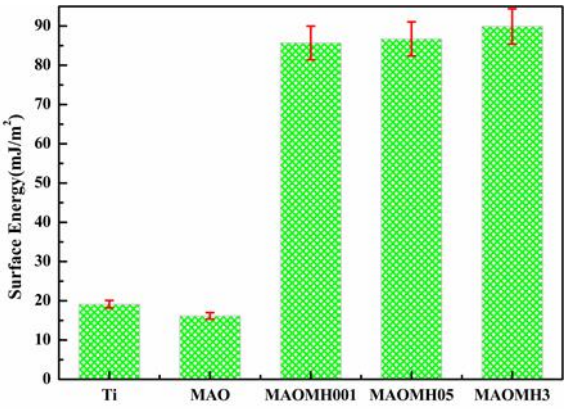


Fig. S2 The surface energies of the Ti, MAO, MAOMH001, MAOMH05 and MAOMH3 samples.

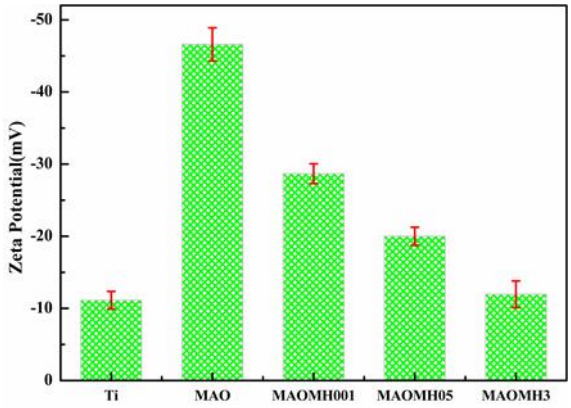


Fig. S3 The zeta potential of the Ti, MAO, MAOMH001, MAOMH05 and MAOMH3 samples.

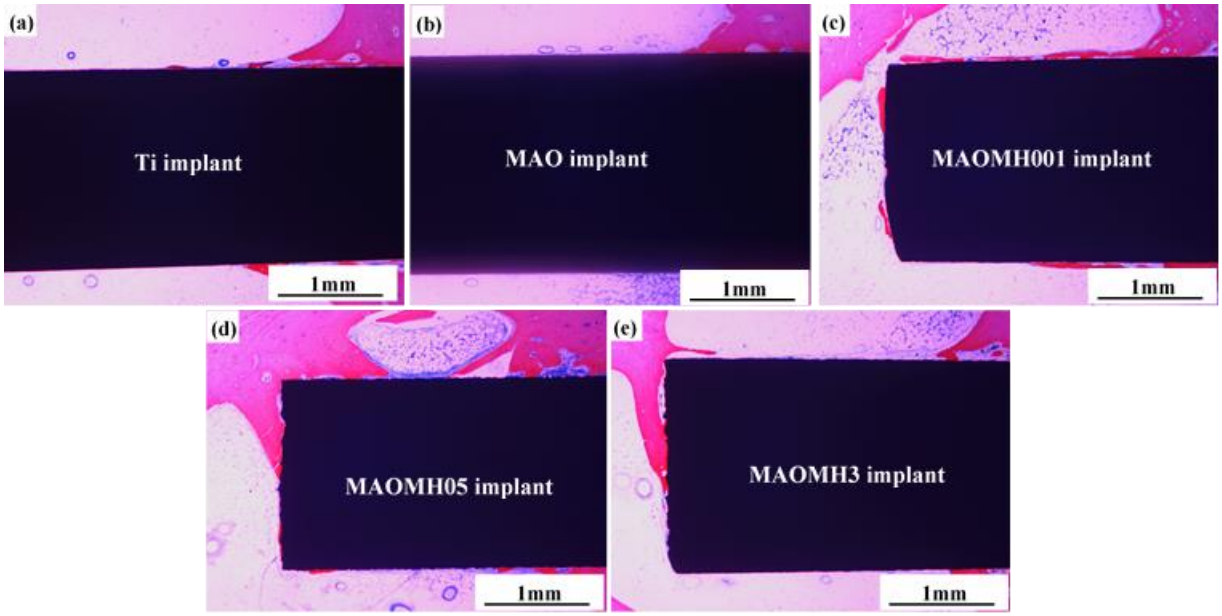


Fig. S4 The histological images of the biological tissue around the implants after implantation in the rabbit tibia for 16 weeks at bone marrow cavity: (a) Ti, (b) MAO, (c) MAOMH001, (d) MAOMH05 and (e) MAOMH3.

## Reference

[1] Owens D K, Wendt R C. Estimation of the surface free energy of polymers [J]. Journal of applied polymer science, 1969, 13(8): 1741-1747.

[2] Du Qing, Wei Daqing, Wang Shaodong, et.al. Rapidly formation of the highly bioactive surface with hydroxyapatite crystals on the titania micro arc oxidation coating by microwave hydrothermal treatment [J]. Applied Surface Science, 2019, 487(9), 708-718.