

## Supplementary Information

### **Assembly of surface-independent polyphenol/liquid gallium composite nanocoatings**

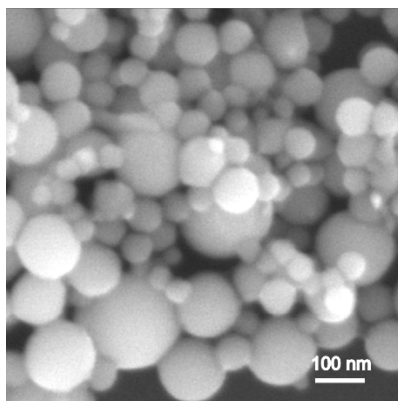
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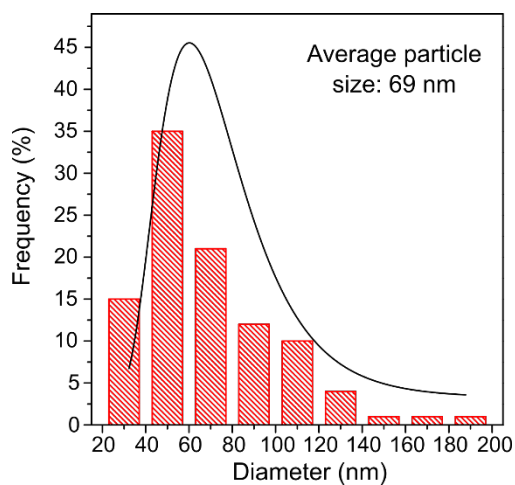
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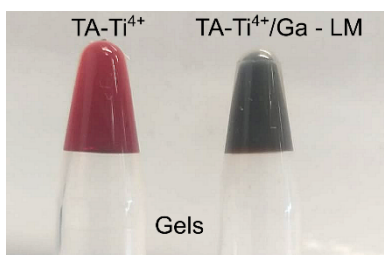
### Ga/TA nanoparticles



**Fig. S1** SEM image of the Ga/TA nanoparticles showing the spherical shape of the particles.

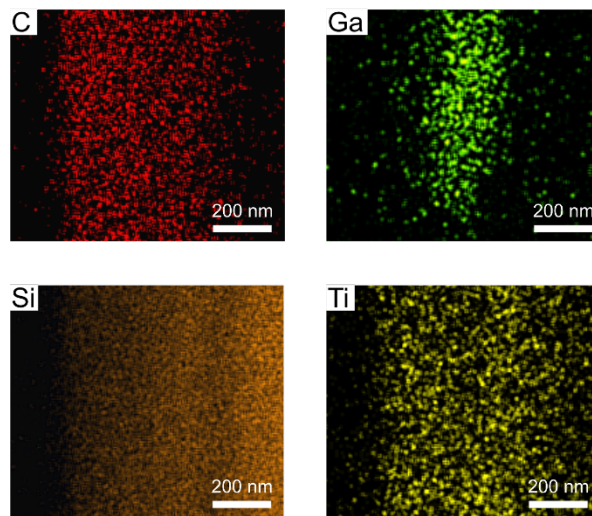


**Fig. S2** Size distribution of the Ga/TA nanoparticles.

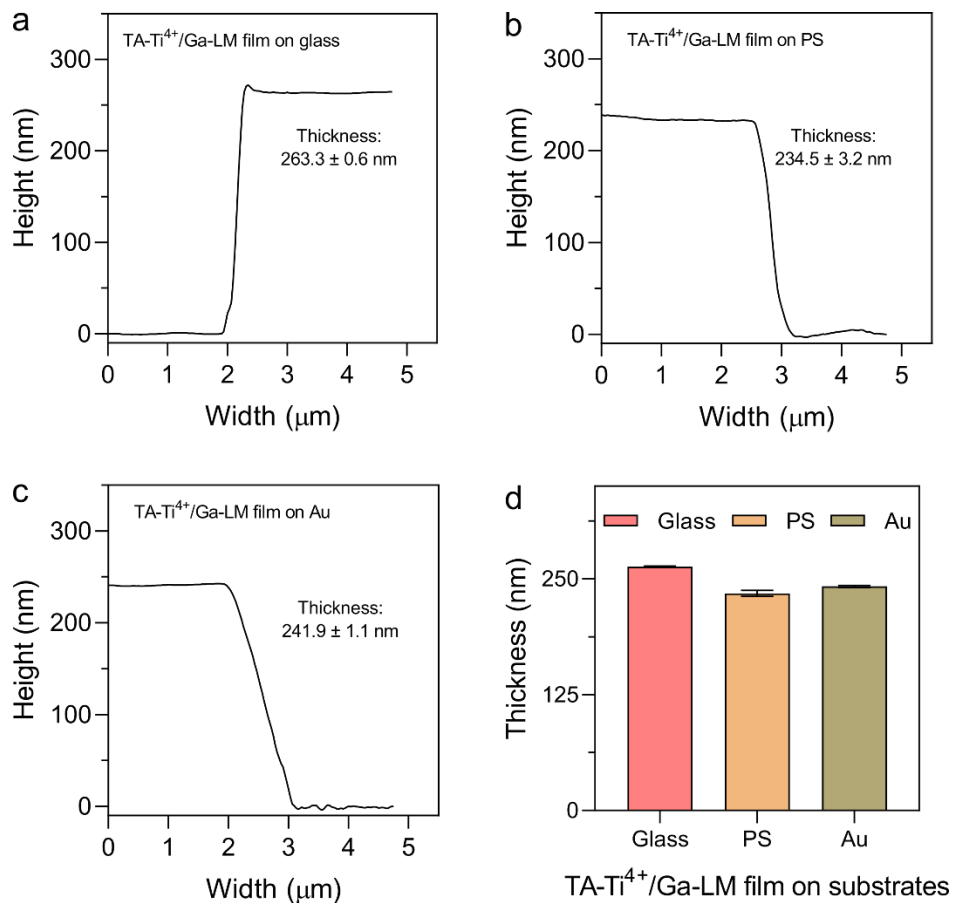


**Fig. S3** TA-Ti<sup>4+</sup> and TA-Ti<sup>4+</sup>/Ga-LM gels with a TA/Ti<sup>4+</sup> molar ratio of 1:5.

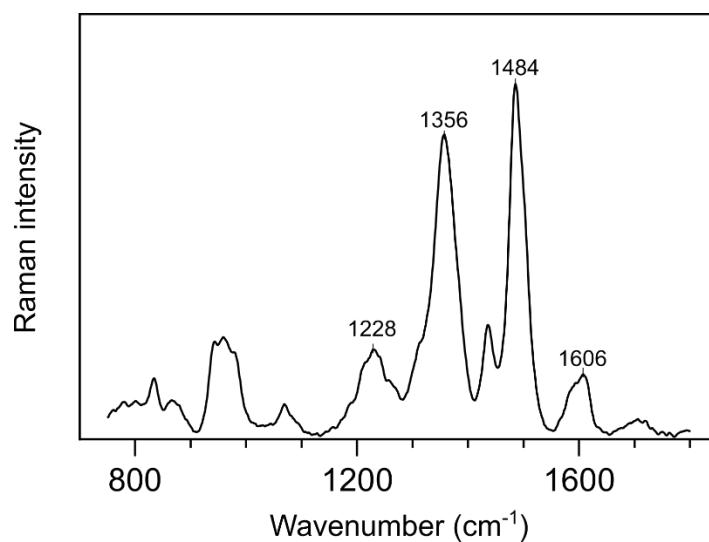
### EDS comparison



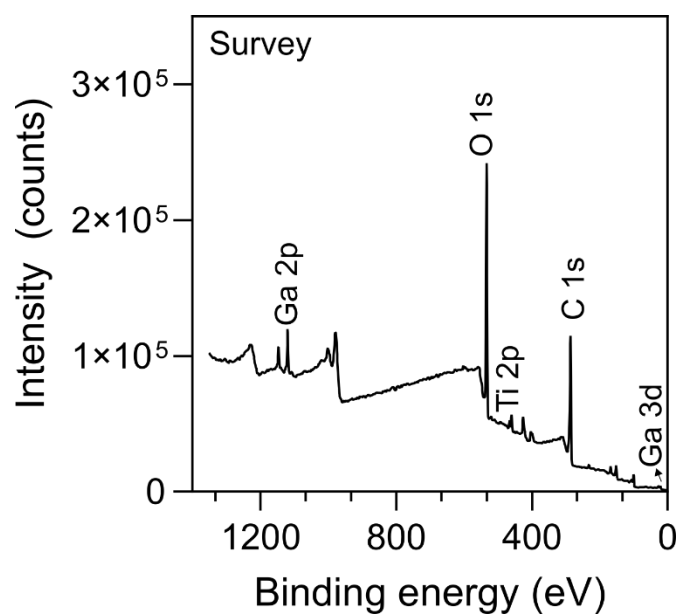
**Fig. S4** EDS comparison of the cross-section of TA-Ti<sup>4+</sup>/Ga-LM nanocoatings.



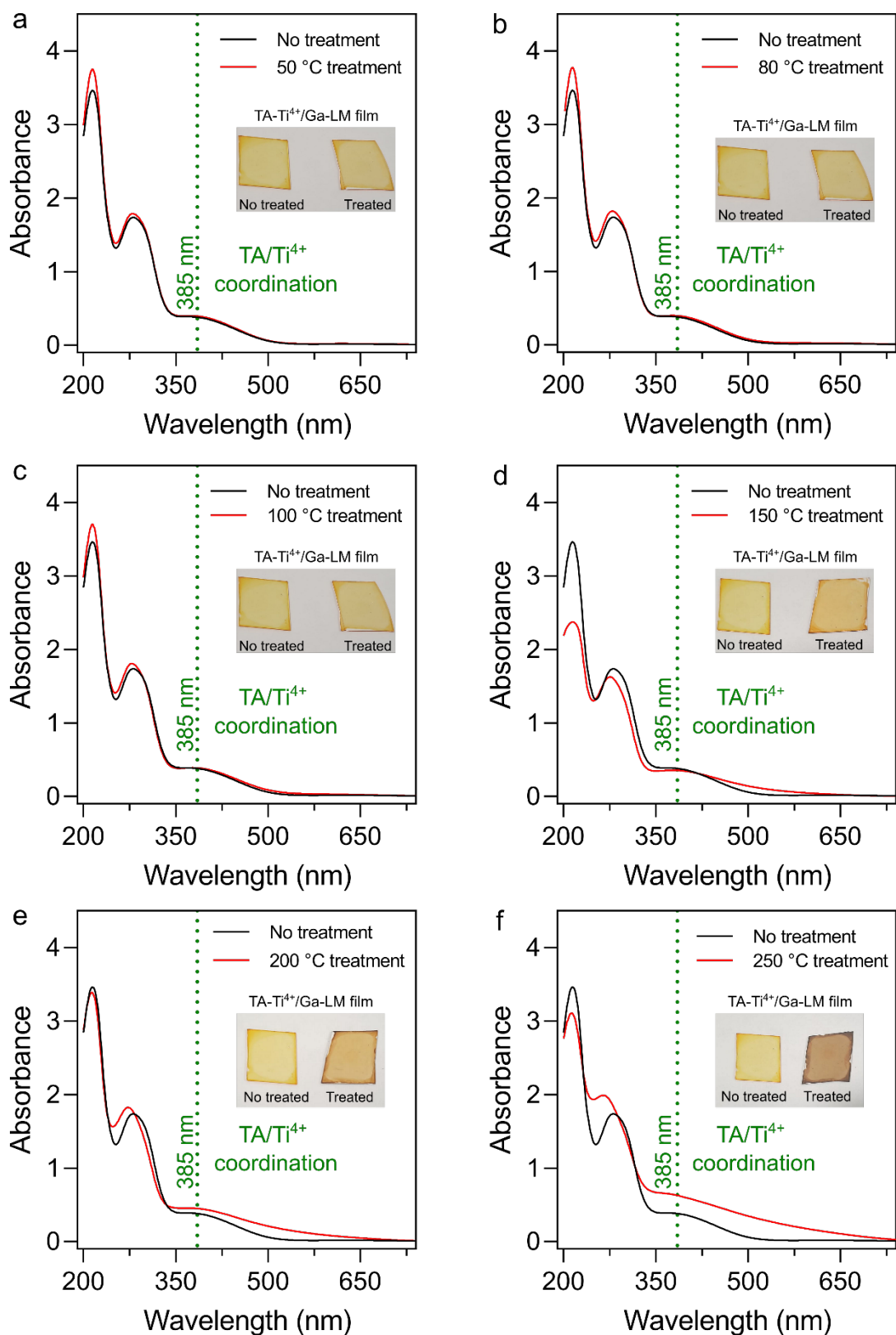
**Fig. S5** Height profiles of the TA-Ti<sup>4+</sup>/Ga-LM nanocoatings on glass (a), PS (b), Au (c) and their corresponding thicknesses (d).



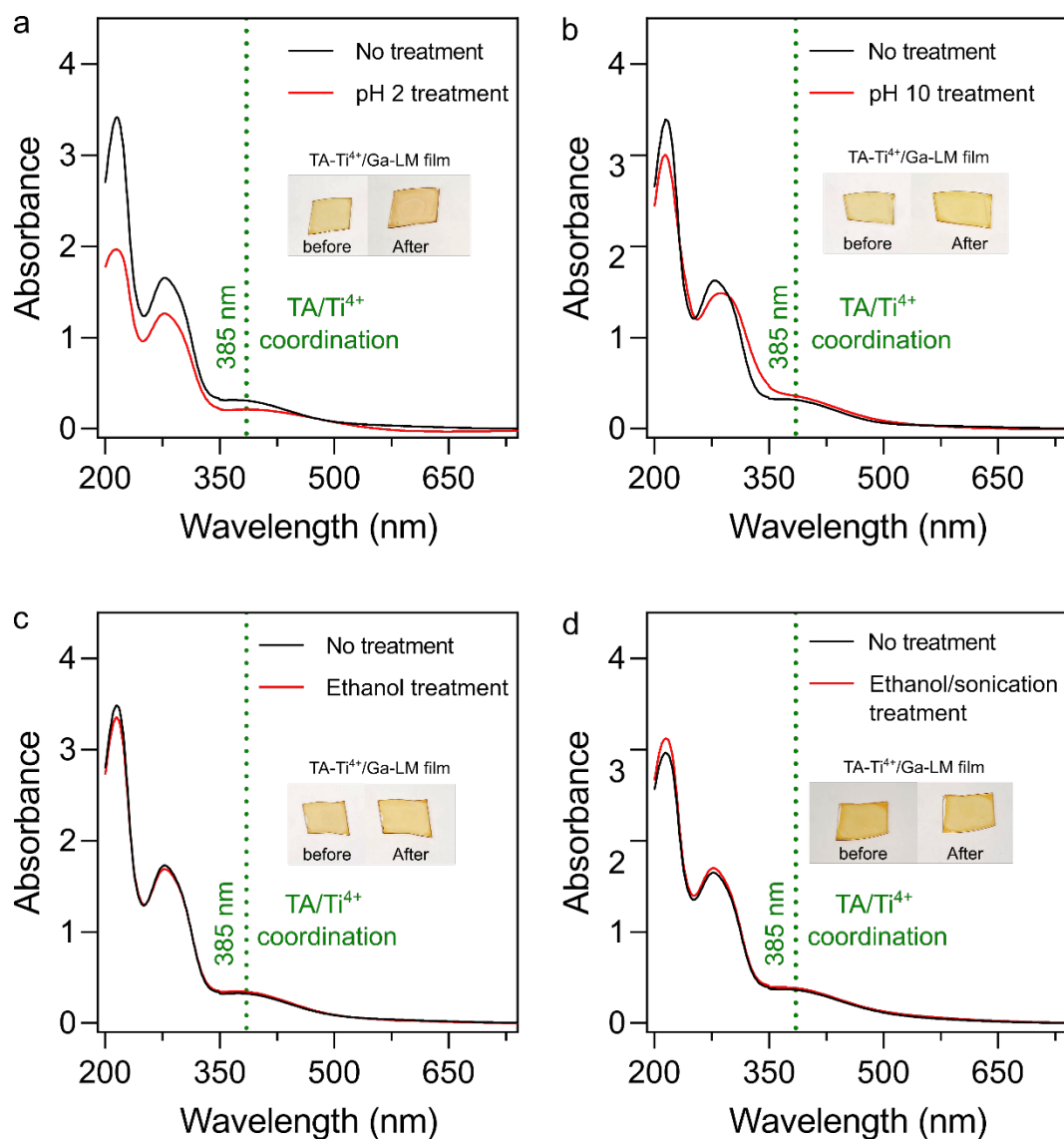
**Fig. S6** Raman spectrum of the control TA-Ti<sup>4+</sup> nanocoatings without LM nanoparticles.



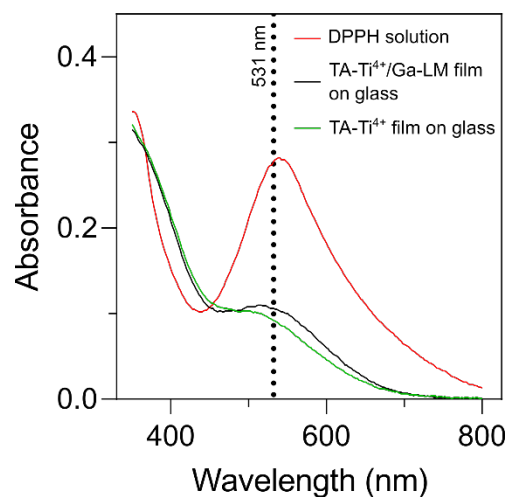
**Fig. S7** XPS survey spectrum of the TA-Ti<sup>4+</sup>/Ga-LM nanocoatings.



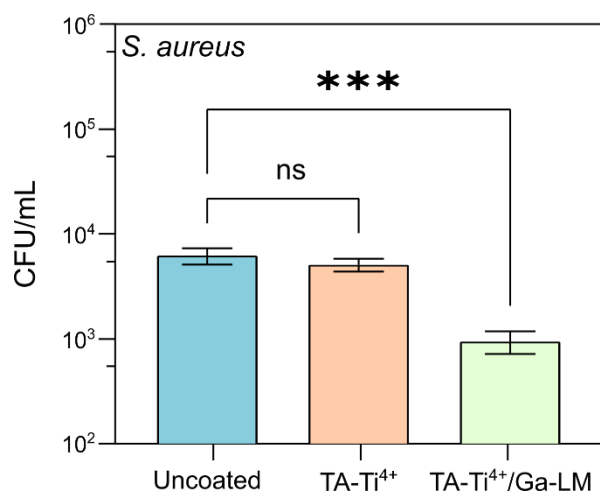
**Fig. S8** Tests for the thermal stability of TA-Ti<sup>4+</sup>/Ga-LM nanocoatings. The UV-Vis absorption spectra of TA-Ti<sup>4+</sup>/Ga-LM coatings after the thermal treatment (~20 min) at 50 °C (a), 80 °C (b), 100 °C (c), 150 °C (d), 200 °C (e), and 250 °C (f). The controls are also presented for comparison.



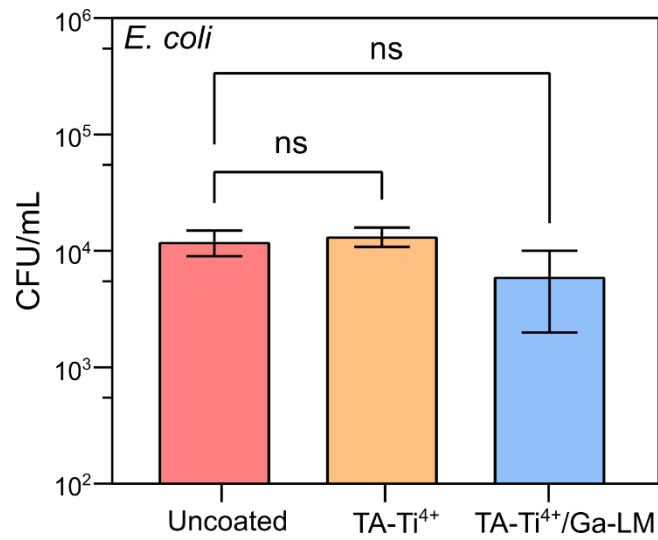
**Fig. S9** Tests for the chemical stability of the TA-Ti<sup>4+</sup>/Ga-LM nanocoatings at pH 2 (a), pH 10 (b), ethanol (c), and under sonication in ethanol for 20 min (d).



**Fig. S10** The decrease in absorbance at 531 nm of DPPH induced by the TA-Ti<sup>4+</sup>/Ga-LM and TA-Ti<sup>4+</sup> nanocoatings on glass substrates.



**Fig. S11** *S. aureus* growth (CFU/mL) in the glass surface of the uncoated glass, TA-Ti<sup>4+</sup>, and TA-Ti<sup>4+</sup>/Ga-LM films. Data presented as the mean ± standard deviation of the mean (n = 3 independent experiments), and significance was assessed using and one-way analysis of variance (ANOVA) with Dunnett post hoc test, resulting p-values, \*p < 0.05, \*\*p < 0.01, \*\*\*p < 0.001.



**Fig. S12** *E. coli* growth (CFU/mL) in the glass surface of the uncoated glass, TA-Ti<sup>4+</sup>, and TA-Ti<sup>4+</sup>/Ga-LM films. Data presented as the mean ± standard deviation of the mean (n = 3 independent experiments), and significance was assessed using and one-way analysis of variance (ANOVA) with Dunnett post hoc test, resulting p-values, \*p < 0.05, \*\*p < 0.01, \*\*\*p < 0.001.