Electronic Supplementary Material (ESI) for Journal of Materials Chemistry B.

Broad-spectrum Treatment of Bacterial Biofilms using Magneto-responsive Liquid Metal Particles

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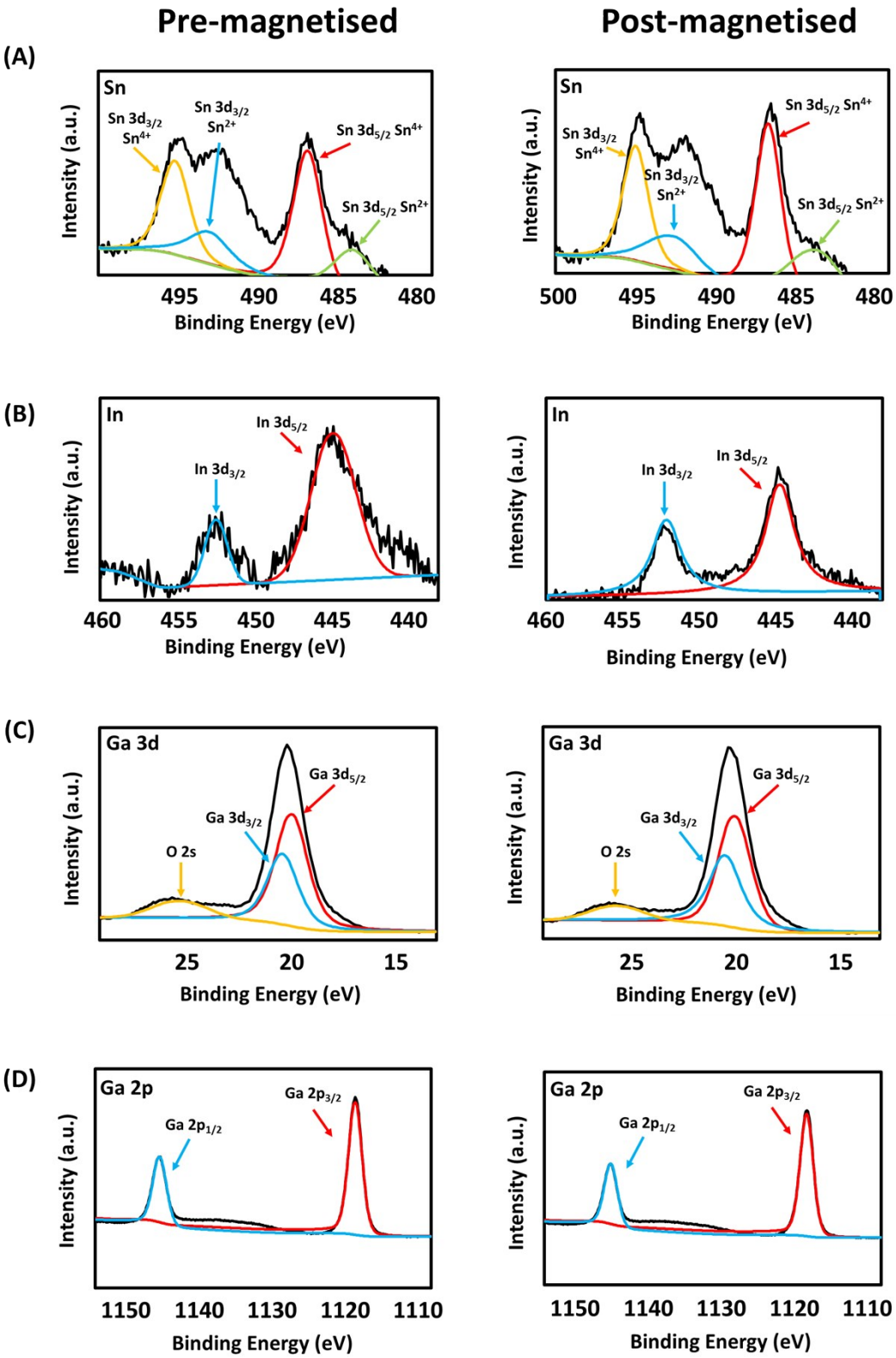
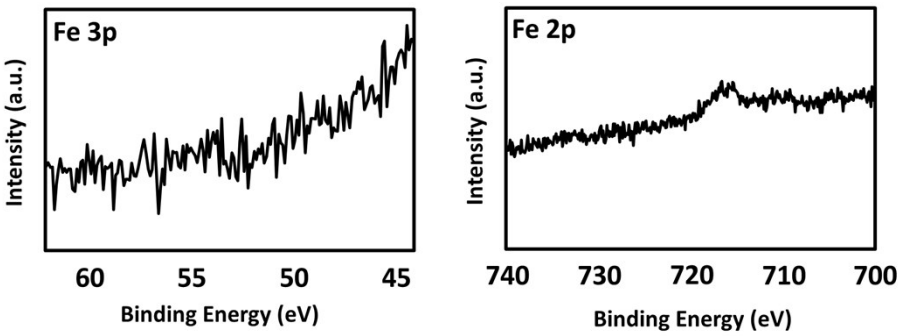


Supporting information

Figure S1. High-resolution XPS spectra of the pre-magnetised and post-magnetised GLM-Fe particles. Importantly, no distinct differences were observed between each sample. (A) Tin, (B) Indium, (C) Gallium 3d, (D) Gallium 2p and (E) Oxygen O1s spectra. Black lines are experimental data.



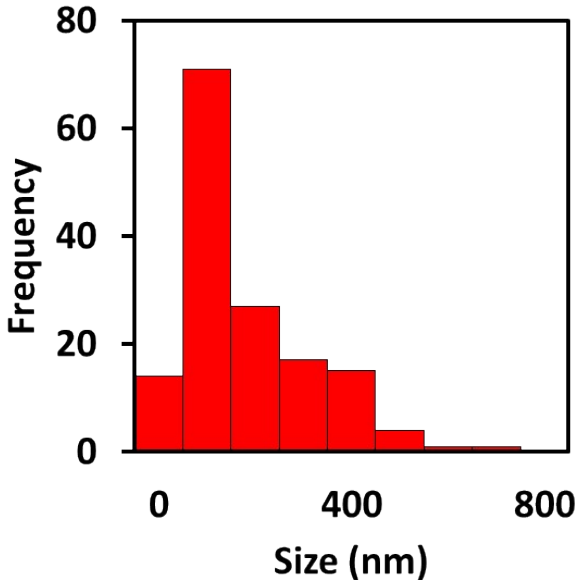
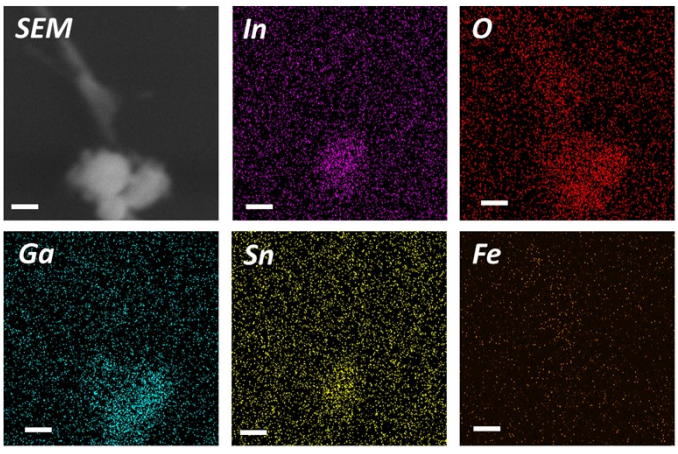


Figure S2. High-resolution XPS Fe 3p (left) and Fe 2p (right) spectra of the pre-magnetised GLM-Fe particles.

Figure S3. The particle size distribution of post-magnetised particles measured using scanning electron micrographs. N = 150.



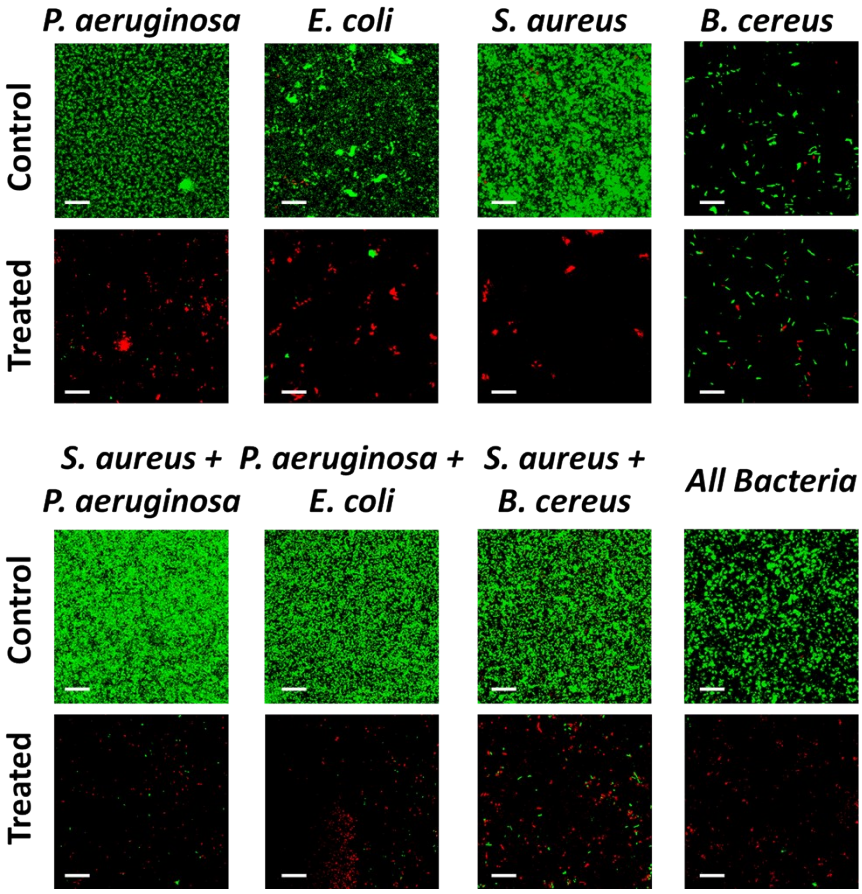


Figure S4. Energy-dispersive X-ray Spectroscopy (EDS) images of the GLM-Fe particles post-magnetisation. Scale bars are all 200 nm.

Figure S5. Representative CLSM images of mono-species (top) and multi-species (bottom) biofilms before and after treatment with GLM-Fe particles. Scale bars are all 10 µm.

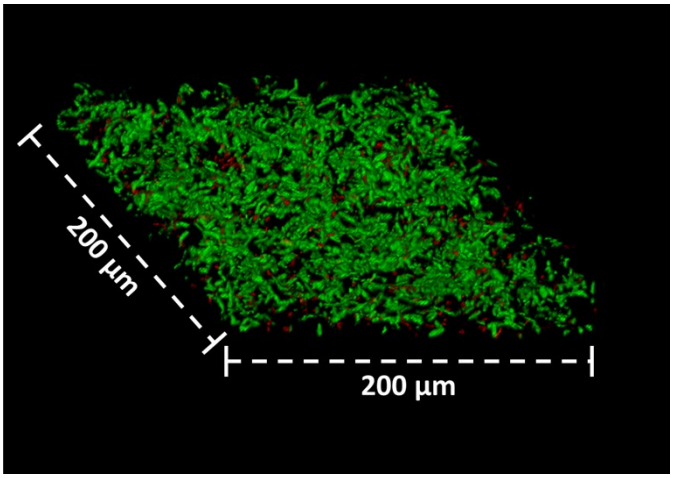


Figure S6. 3D CLSM image of *B. cereus* floc using fluorescent dyes to visualise the live (green) and dead (red) cells. The image was taken at the air-liquid interface; cells are predominately viable and show substantial aggregation.

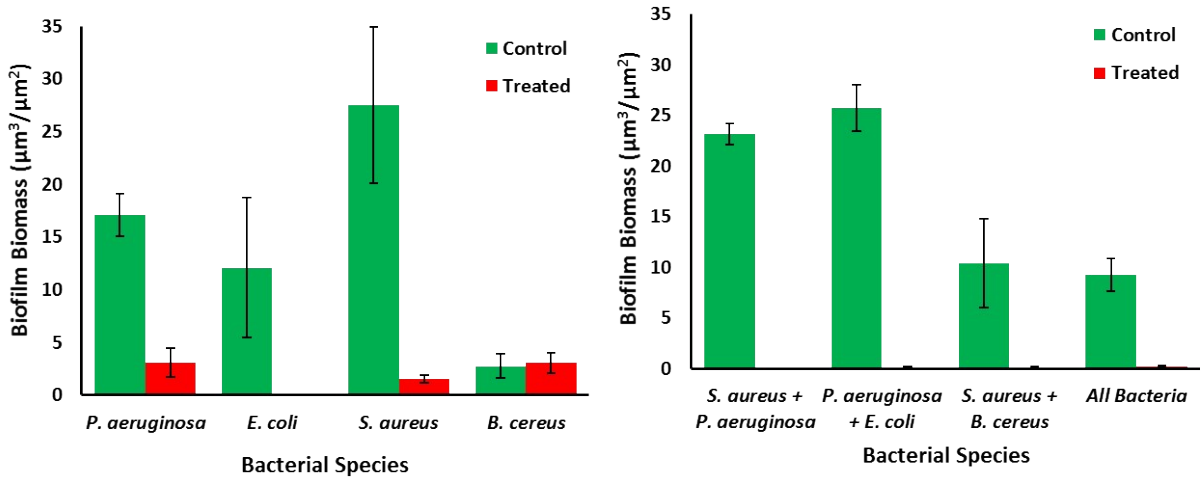


Figure S7. Biofilm biomass following treatment for mono-species (left) and multi-species (right) biofilms.

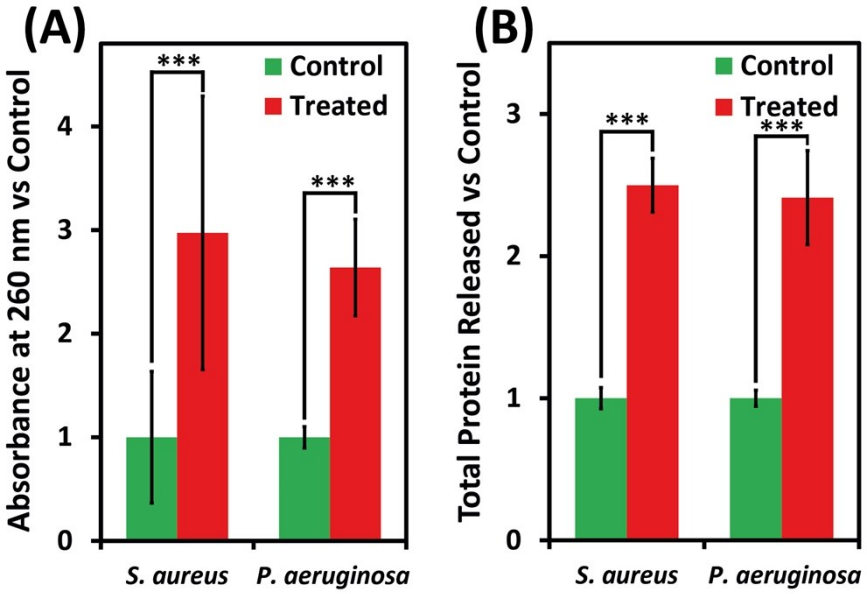


Figure S8. Leakage of intracellular components of biofilm samples treated with actuated-GLM-Fe particles compared to the control. (A) Absorbance at 260 nm indicative of nucleic acids, (B) total protein released measured using a BCA assay.

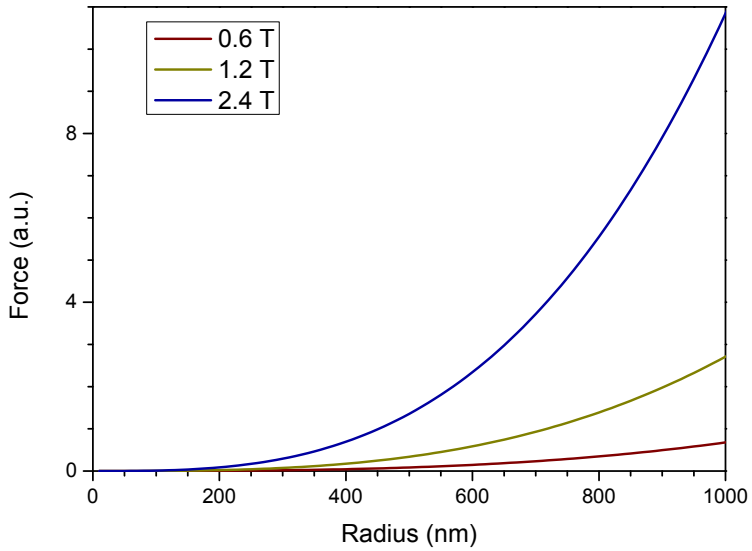


Figure S9. Demonstration of the relationship between the size of magnetic particles and their force with respect to different magnetic flux densities. Force units are arbitrary as they depend on the magnetic susceptibility of the material which can differ due to factors such as elemental composition and/or crystal structure.

Figure S9 was constructed from the following formula:

$$\vec{F_m} = \mu_0 \frac{4}{3} \pi R^3 \chi \left(\vec{H_a} \cdot \nabla\right) \vec{H_a}$$

Where $\vec{F_m}$ is the force exhibited by the particle in response to the magnetic field, μ_0 is the magnetic permeability of the free space, R is the radius of the particle, χ is the magnetic susceptibility of the magnetic component and $\vec{H_a}$ is the magnetic flux density acting on the particle.