

## Supporting information

### **One-step biosynthesis of soft magnetic bacterial cellulose spheres with localized nanoparticles functionalization**

Soledad Roig-Sanchez\*<sup>1</sup>, Oriol Torrecilla\*<sup>1</sup>, Jordi Floriach-Clark<sup>1</sup>, Sebastià Parets<sup>1</sup>, Pavel A.

Levkin<sup>2</sup>, Anna Roig<sup>+1</sup>, Anna Laromaine<sup>+1</sup>

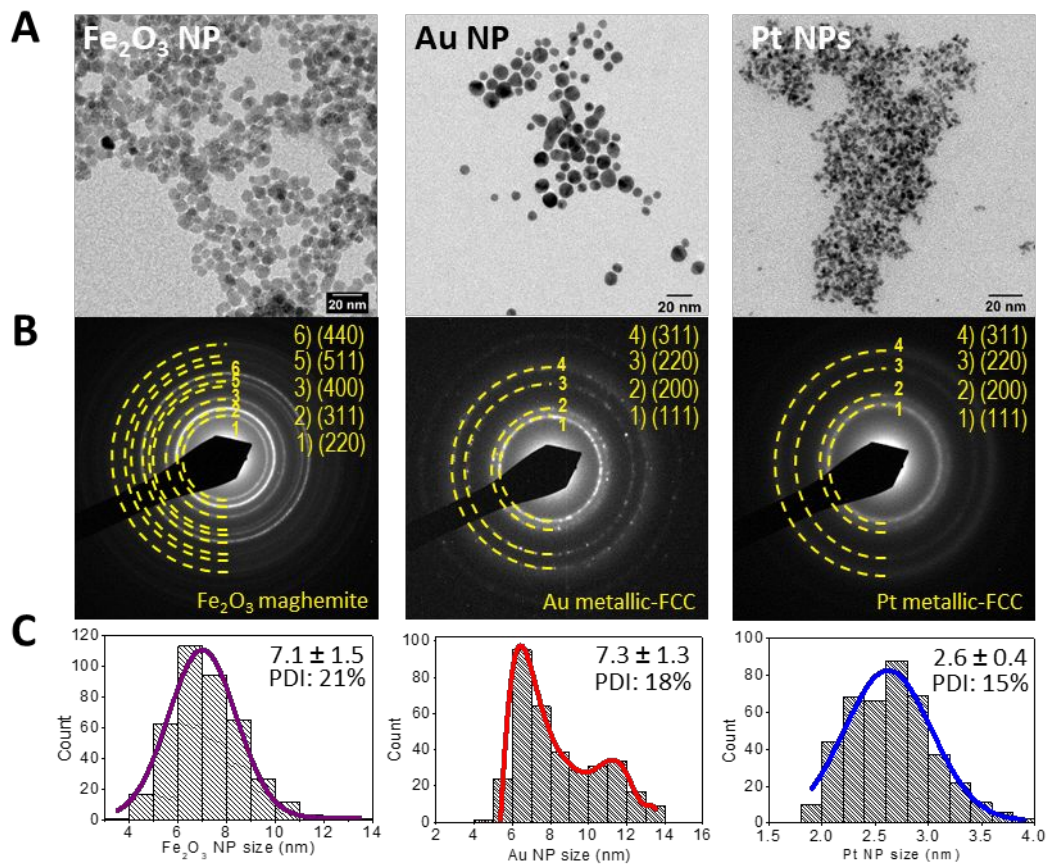
<sup>1</sup> Institut de Ciència de Materials de Barcelona, ICMA-B-CSIC, Campus UAB, 08193 Bellaterra, Spain

<sup>2</sup> Institute of Biological and Chemical Systems-Functional Molecular Systems (IBCS-FMS), Karlsruhe Institute of Technology (KIT), 76344, Eggenstein-Leopoldshafen, Germany

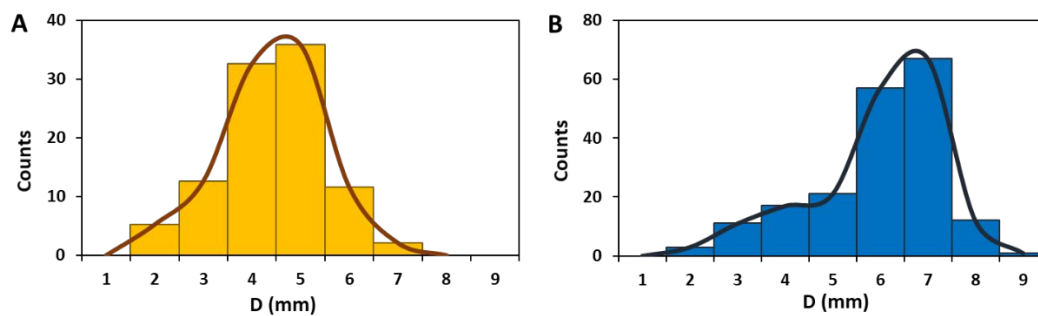
\* Authors contributed equally to the work

+ Corresponding authors: alaromaine@icmab.es

**Figure S1:** Nanoparticle characterization. A) TEM picture of the nanoparticles synthesized in-house ( $\text{Fe}_2\text{O}_3$  and Au) and commercially available (Pt). B) SAED images of the different systems where the characteristic crystallographic planes are highlighted. C) Particle size distribution computed from TEM images.



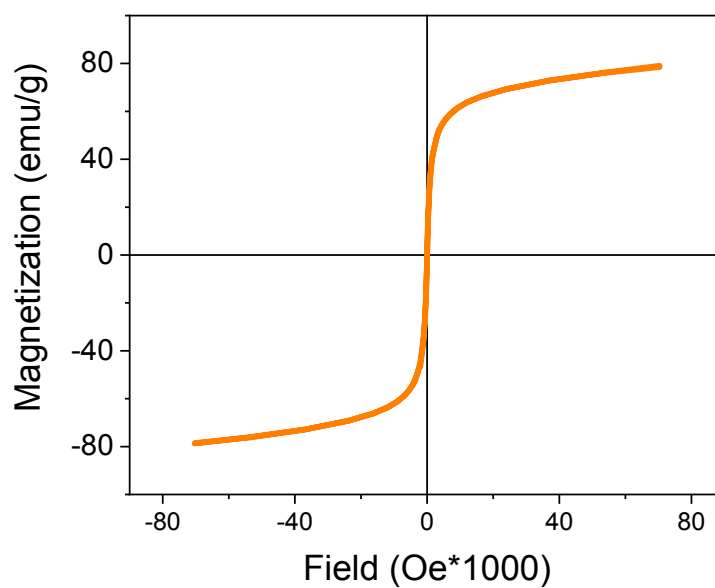
**Figure S2:** A) f-BCS-SP size histogram showing a maximum peak at  $4 \pm 1$  mm ( $n = 95$ ). B) f-BCS size histogram showing a maximum peak at  $6 \pm 1$  mm ( $n = 185$ ).



**Table S1:** Speed response of h-BCS-SP with different SPIONs concentrations towards a magnetic field applied.

Magnetic response	
[SPIONs] (mg/mL)	Speed (mm/s)
0.13	$5.7 \pm 1.4$
0.25	$7.5 \pm 0.3$
2.50	$13.5 \pm 1.7$

**Figure S3:** Magnetization vs. applied magnetic field at 300K of h-BCS-SP with 2.50 mg/mL SPIONs.



**Figure S4:** Videos showing the different speed orientation and movement of h-BCS-SP with different SPIONs concentration.

**Figure S5:** Images showing the shape change of A) f-BCS and B) h-BCS, after being squeezed through a 2 mm syringe diameter (upper panel) and a 0.4 mm syringe diameter (bottom panel). For a better clarity BCS were dyed with Thymol blue and Safranin-O. Scale bar: 1 mm.

