Bio-inspired functionalised magnetic nanomaterials as energy storage devices

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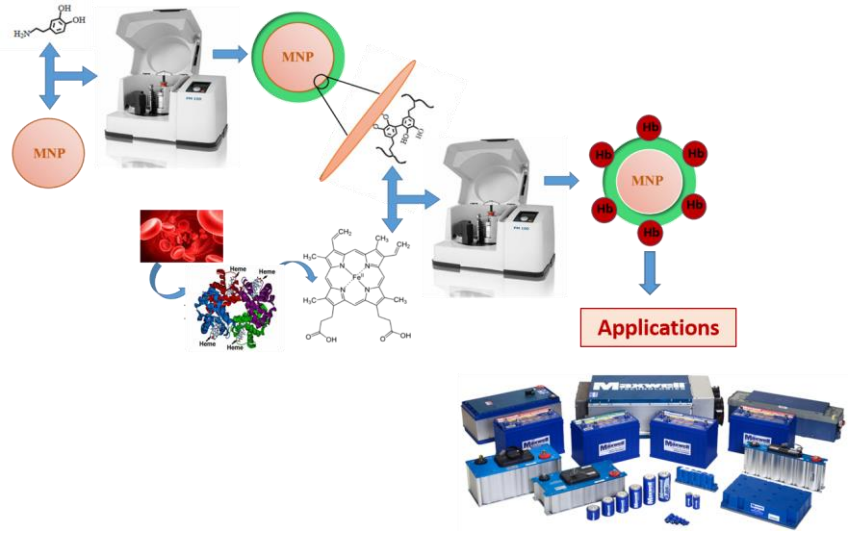
Hemoglobin and magnetic nanoparticles were employed to obtain a bio-modified nanomaterial using a simple solventless mechanochemical milling process.[1] Dopamine was used as a robust anchoring agent to design stable nanostructures.[2] The XPS spectrum show the band (400 eV) corresponding to nitrogen which confirms the presence of Hb in the obtained nanostructure. In addition, the amide I and amide II bands at 1654 cm^{-1} and 1545 cm^{-1} in the FT-IR spectrum indicate that Hb does not undergo changes in its secondary structure. This supposition was verified by Resonance Raman spectroscopy. TEM images display a homogeneous distribution of the Hb-DP-MNP, with a particle diameter of 10.1±0.2 nm.

Functionalized materials exhibited a significant magnetism, preserved upon functionalization. The functionalized Hb-DP-MNP nanocomposite was successfully employed in the design of a supercapacitor (specific capacitance: 115 Fg^{-1}) with excellent cycling durability, over 94% specific capacitance retained after 1000 cycles.



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2. W.-H. Zhou, C.-H. Lu, X.-C. Guo, F.-R. Chen, H.-H. Yang and X.-R. Wang, *J. Mater. Chem.* 2010, **20**, 880.

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