**Biomimetic NanoZymes as promising photo-activatable antimicrobial agents and pro-drug therapies**

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Nanomaterials are well-known for their impressive catalytic activity. However, recently, an increasing number of inorganic nanomaterials are being discovered to behave similar to the natural biomolecular enzymes, and they are typically referred as ‘NanoZymes’. This biomimetic activity of nanomaterials is establishing NanoZymes as artificial inorganic enzymes, and the research field has just begun to explore this unique property of nanomaterials for a range of applications from diagnostics to therapy. In particular, the focus of our team has been to (i) discover nanozyme activity in new materials,1-3 (ii) develop material synthesis approaches that show multiple or new enzyme-like activities in a single/hybrid materials, e.g. nanozymes with apparent mimicry of diverse mammalian enzymes, including unique pan-glycosidases,3 (iii) understand the mechanism of nanozyme activity in nanomaterials,3 (iv) modulate nanozyme activity through external stimuli such as light,4 (v) use nanozymes to develop highly specific colorimetric biosensors,1-2,5-7 and (vi) explore the potential of nanozymes for therapeutic applications such as pro-drug therapy3 and photo-activatable antimicrobials.4 We have achieved this progress by studying the nanozyme activity of over 100 nanomaterials that has allowed to draw some generalised trends about the behaviour of nanozymes. In the current talk, some of these recent developments with a focus on explaining the mechanistic behaviour of nanozymes that will reveal the similarities (and dissimilarities) of nanozymes with the natural biological systems will be discussed. We will then relate this biomimetic behaviour for the rationale exploitation of inorganic nanomaterials for pro-drug therapies and photo-activatable antimicrobial agents.

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