

## The metal/non-metal trajectory in sustainable chemistry

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Heterogeneous transition metal catalysts are generally based on nanoparticles, that nowadays can be synthesized with uniform size and shape. The extraordinary advances in material science inspired a new vision for nanoscale-inspired design and synthesis of industrially important catalysts, where new synthetic strategies for materials are combined with emerging concepts in catalysis. The possibility to exert a precise structural and morphological control, coupled with the tailored modulation of the metal-support interactions, allowed us to have a step change increase in the activity, selectivity and stability of many industrially and environmentally important catalysts.<sup>[1-5]</sup> Furthermore, single atom<sup>[6]</sup>, metal-free<sup>[7-9]</sup> and photothermal<sup>[10]</sup> catalysts are becoming an essential modern strategy to address current sustainability guidelines, in particular if the reliance on costly elements is abandoned. Such emerging catalysts are deemed to go beyond fundamental research, and will propel industrial interests toward the establishment of green organic synthesis, renewable energy conversion, pollution prevention and control, which represent the real challenges of the 21<sup>st</sup> century and the focus of the present talk.

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