Title:	Facile transfer of excited electrons in Au/SnS2 nanosheets for efficient solar-driven selective organic transformations
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Abstract:	Solar driven aerial oxidation processes have gained importance in organic transformations leading to the development of many nanocrystalline photocatalysts. Although such nanomaterials have many potential advantages, they often underperform due to poor visible light absorption and rapid recombination of excitons. Incorporation of plasmonic nanoparticles (NPs) on the catalyst surfaces can extend their response to visible light and improve photocatalytic efficiency by the ‘hot-electron’ injection mechanism. Nanostructures of SnS2 too absorb a part of the visible light to induce many photocatalytic reactions, though their ability to perform the selective and controlled organic transformations has not yet been observed. Herein, we demonstrate the first example of such transformation with the oxidative coupling of various benzylamine (BA) derivatives to imines under ambient conditions using SnS2nanosheets (NSs). The reaction rate improves manifold and shows ~98 %conversion (>99 % selectivity) in 2 h under direct sunlight and open-air when the NSs were decorated with 1.5 wt% Au NPs on (Au/SnS2), making it one of the best catalysts for this reaction. We found that the large enhancement in activity upon Au loading is accompanied by a noticeable change in photo-induced charge accumulation behaviour in Au/SnS2 from the usual “spike and overshoot” one and contributed by facile transfer of excited electrons across the Au-SnS2 heterojunction in which Au NPs act as both sources and sinks for the photo-excited electrons. Finally, a detailed mechanism of the oxidation reaction has been proposed.
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