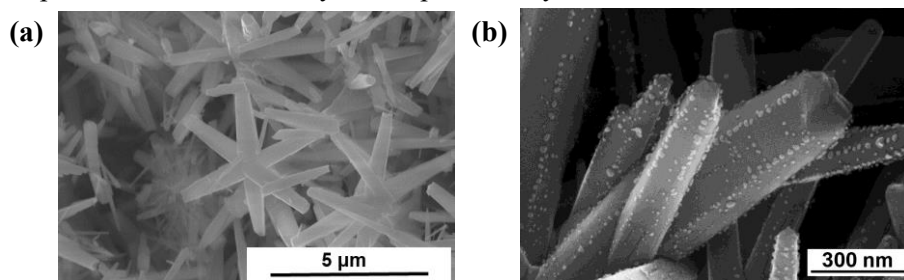


## Site-selective photodeposition of gold nanoparticles on the edges of ZnO nanowires

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Selective modification of chemically active sites on supports, such as steps, edges, and corners, with metal nanoparticles (NPs) is a challenging topic in the fields of catalysis and photocatalysis. Focusing on the support, rapid progress is currently being made in the synthesis of MO nanocrystals (NCs) with well-defined facets. Their edges and corners can be viewed as surface defects consisting of linear arrays of chemically active atoms with a high degree of coordinative unsaturation. Therefore, selective and dense formation of metal NPs on chemically active edges and corners should be effective for improving catalytic and photocatalytic activities. However, the formation of site-selective, high-density metal NPs on a support has not yet been achieved. Radial ZnO mesocrystals (rad-ZnO MC) (Fig 1a) composed of hexagonal nanowires (NWs) with {10-10} sidewalls were synthesized by a simple solution-phase method.<sup>1</sup> Here we show that Au NPs are densely aligned along the edges of ZnO NWs by photodeposition from an O<sub>2</sub> free aqueous methanol solution of HAuCl<sub>4</sub>, even though the Au complexes are uniformly adsorbed across the entire surface of the ZnO NWs (Fig 1b). Based on the results of experiments and density functional theory calculations, we proposed a reaction mechanism of the site-selective photodeposition involving the reduction of the Au complex by the excited electrons instantly relaxed at the edge sites followed by the crystal growth. This study encourages us to apply the site-selective photodeposition to other faceted semiconductor nanocrystals and to contribute to the improvement in their catalytic and photocatalytic activities.



**Fig. 1** (a) SEM image of rad-ZnO MC. (b) SEM image of Au nanoparticle-loaded rad-ZnO MC prepared by the photodeposition

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