Enhanced Photoreactivity of MOFs by Intercalating Interlayer Bands via simultaneous -N=C=O and -SCu Modification

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Abstract

Herein, we propose a novel method to enhance the photoreactivity of an MOF catalyst by grafting isocyanate bonds (-N=C=O) and sulfhydryl-complexed copper (-SCu) onto ZIF-8 (NIF-SCu). The grafting process intercalated interlayer bands between the conduction and valence bands of ZIF-8, thereby providing a "ladder" for facile electron transition. The extreme improvement in the photoreactivity of NIF-SCu could be attributed to the enhancement in light responses in the range of 350–450 nm by -N=C=O groups and the widening of the visible light range of the MOF by -SCu groups. The formation of staggered energy levels in NIF-SCu could also narrow the band gap, lower the resistance, and facilitate the transfer of photogenerated carriers, thereby generating electrons with strong reduction potential in the -SCu conduction band. This study provides a new strategy for improving or even endowing the photoactivity of environmental functional materials with wide bandgaps.

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