Enhanced photoelectrochemical cathodic protection performance of TiO_2 (or $BiVO_4$)-based nano-heterojunction composites for metals in marine environments

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Abstract Metal materials are widely used in marine engineering, so the stability and reliability of metal is extremely important for marine engineering. Therefore, metal corrosion in marine engineering is a major problem that must be solved. Photocathodic protection (PCP) technology is a novel and green cathodic protection technology, which uses the photoelectric conversion performance of semiconductor materials to achieve the protection of metal materials. It was found that TiO_2 and $BiVO_4$ had some protective effects on metals. However, The recombination of photogenerated electrons and holes is a major factor that restricts the poor PCP performance of photoanodes. Our study shows that, nanoheterojunction composites of energy storage materials (such as tin dioxide or tungsten oxide) combined with metal sulphide semiconductors with negative conduction potential can play a good role in PCP of hard-to-protect metals (such as carbon steel). The key to improve the PCP performance of these materials is how to improve the stability of these nanoheterojunction materials and the continuous protection of photoanodes in dark state.

Keywords Photocathodic protection; TiO_2; $BiVO_4$; SnO_2; WO_3; metal sulphide

Reference

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