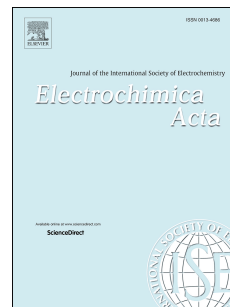


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Photo-electro synergistic catalysis: Can Pd be active for methanol**2 electrooxidation in acidic medium?**

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10 **Abstract:** *Development of alternative Pt-free electrocatalyst for methanol oxidation*
reaction (MOR) in acidic medium remains a big challenge. As is reported, Pd is a
12 *good electrocatalyst for MOR in alkaline medium, but it is commonly recognized as*
inactive in acidic medium. Herein, we report an active Pd nanoparticles
14 *electrocatalyst for MOR in acidic medium although its catalytic activity is low. The*
photoexcitation of the plasmonic Pd nanoparticles leads to an MOR activity
16 *enhancement by a factor of 2 under visible light. Interestingly, the photogenerated*
electron-hole separation on nanosized TiO₂ and the surface plasmon resonance effect
18 *of Pd nanoparticles on Pd/TiO₂ heterostructure synergistically promote the*
photo-electrocatalytic activity of MOR under simulated solar light. The 17.9-fold
20 *activity enhancement of MOR in the presence of UV light indicates that the*

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