

Effects of plasmon excitation on photocatalytic activity of Ag/TiO₂ and Au/TiO₂ nanocomposites - DTU Orbit (09/11/2017)

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Model nanocomposite photocatalysts consisting of undoped TiO₂ films with optically active Ag or Au nanoparticles (NPs) were designed, fabricated, and examined to address the role of plasmon excitations in their performance. Different composition configurations were tested in which the NPs were either facing the reaction environment or not, and in direct contact or not with TiO₂. We found, as measured for the reactions of methanol and ethylene oxidation in two different photoreactors, that composites always show enhanced activity (up to ×100 for some configurations) compared to bare TiO₂. We deduced from in situ localized surface plasmon resonance spectroscopy measurements that the interfacial charge transfer from TiO₂ to NPs plays a major role in the activity enhancement for composite configurations where particles are in direct contact with TiO₂. Plasmonic near- and far-field effects were only observed when the plasmon resonance energy overlaps with the bandgap energy of undoped TiO₂.

General information

State: Published

Organisations: Department of Physics, Experimental Surface and Nanomaterials Physics, Chalmers University of Technology

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Pages: 214-221

Publication date: 2013

Main Research Area: Technical/natural sciences

Publication information

Journal: Journal of Catalysis

Volume: 307

ISSN (Print): 0021-9517

Ratings:

BFI (2017): BFI-level 2

Web of Science (2017): Indexed yes

BFI (2016): BFI-level 2

Scopus rating (2016): CiteScore 7.27 SJR 2.441 SNIP 2.154

Web of Science (2016): Indexed yes

BFI (2015): BFI-level 2

Scopus rating (2015): SJR 2.703 SNIP 2.198 CiteScore 7.23

Web of Science (2015): Indexed yes

BFI (2014): BFI-level 2

Scopus rating (2014): SJR 2.685 SNIP 2.25 CiteScore 6.92

Web of Science (2014): Indexed yes

BFI (2013): BFI-level 2

Scopus rating (2013): SJR 2.56 SNIP 2.108 CiteScore 6.42

ISI indexed (2013): ISI indexed yes

Web of Science (2013): Indexed yes

BFI (2012): BFI-level 2

Scopus rating (2012): SJR 3.005 SNIP 2.277 CiteScore 6.17

ISI indexed (2012): ISI indexed yes

Web of Science (2012): Indexed yes

BFI (2011): BFI-level 2

Scopus rating (2011): SJR 3.11 SNIP 2.207 CiteScore 6.23

ISI indexed (2011): ISI indexed yes

Web of Science (2011): Indexed yes

BFI (2010): BFI-level 2

Scopus rating (2010): SJR 3.376 SNIP 2.213

Web of Science (2010): Indexed yes

BFI (2009): BFI-level 2

Scopus rating (2009): SJR 2.951 SNIP 2.158

Web of Science (2009): Indexed yes

BFI (2008): BFI-level 2

Scopus rating (2008): SJR 3.115 SNIP 2.184

Web of Science (2008): Indexed yes

Scopus rating (2007): SJR 3.148 SNIP 2.153

Web of Science (2007): Indexed yes

Scopus rating (2006): SJR 3.129 SNIP 2.023

Web of Science (2006): Indexed yes

Scopus rating (2005): SJR 2.986 SNIP 2.16

Web of Science (2005): Indexed yes

Scopus rating (2004): SJR 2.64 SNIP 1.964

Web of Science (2004): Indexed yes

Scopus rating (2003): SJR 2.147 SNIP 1.87

Web of Science (2003): Indexed yes

Scopus rating (2002): SJR 2.49 SNIP 1.803

Web of Science (2002): Indexed yes

Scopus rating (2001): SJR 2.943 SNIP 1.931

Web of Science (2001): Indexed yes

Scopus rating (2000): SJR 2.85 SNIP 2.22

Web of Science (2000): Indexed yes

Scopus rating (1999): SJR 2.635 SNIP 2.013

Original language: English

Ethylene, Gold, Mechanisms, Metal nanoparticles, Nanocomposite films, Nanocomposites, Photocatalysis, Photocatalysts , Plasmons, Silver, Surface plasmon resonance, Titanium dioxide

DOIs:

10.1016/j.jcat.2013.07.024

Source: dtu

Source-ID: n::oai:DTIC-ART:compendex/391910471::31817

Publication: Research - peer-review › Journal article – Annual report year: 2013