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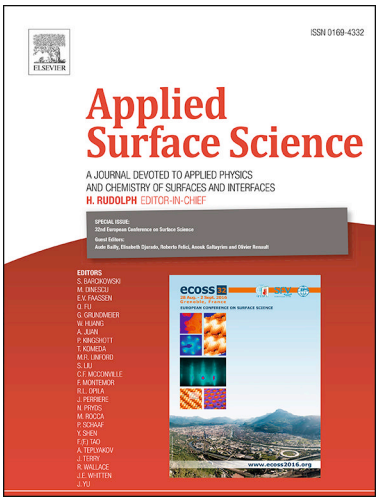

Full Length Article

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PII: S0169-4332(18)30725-6
DOI: https://doi.org/10.1016/j.apsusc.2018.03.054
Reference: APSUSC 38802

To appear in: *Applied Surface Science*

Received Date: 14 September 2017
Revised Date: 14 February 2018
Accepted Date: 7 March 2018

Please cite this article as: D. Gilea, T. Radu, M. Muresanu, G. Carja, Plasmonic photocatalysts based on silver nanoparticles - layered double hydroxides for efficient removal of toxic compounds using solar light, *Applied Surface Science* (2018), doi: https://doi.org/10.1016/j.apsusc.2018.03.054

Plasmonic photocatalysts based on silver nanoparticles - layered double hydroxides for efficient removal of toxic compounds using solar light

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Abstract

Plasmon-enhanced photocatalysis holds important promise for chemical processes and outcomes. We present here the self-assemblies of silver nanoparticles (AgNP)/layered double hydroxides (LDHs MeAlLDHs with Me^{2+}=Zn^{2+};Mg^{2+}) and their derived AgNP/MMOs (type AgNP/$MgAl_2O_4$; AgNP/ZnO/$ZnAl_2O_4$) as novel plasmonic photocatalysts exhibiting activity for phenol photodegradation from aqueous solution by solar-light. The fabrication procedure of AgNP/LDHs assemblies is simple and cost effective and is based on the *in-situ* synthesis of AgNP on the LDHs matrices during the reconstruction of MgAlLDH and ZnAlLDH in the aqueous solution of Ag_2SO_4. The tested catalysts were thoroughly investigated by XRD, XPS, TEM and UV-Vis techniques to obtain information on their crystalline structure (XRD), surface properties (XPS), morphological features (HRTEM) and optical properties (UV-Vis). The results show that the solar photocatalytic response of the catalysts is ascribed to the plasmonic response of AgNP though the catalytic efficiency is strongly influenced by the composition of the MeAlLDHs. The best photocatalytic performance was obtained on AgNP/ZnAlLDH750 catalyst that degraded 100% of phenol after 80 min of irradiation with solar light. These results reveal the high potential to tailor AgNP/LDHs and AgNP/MMOs as efficient photo-functional plasmonic hybrids for waste-water cleaning.

Keywords: plasmonic silver, layered double hydroxides, waste-water cleaning