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Water Science and Technology: Water Supply
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Influence of pyrolytic seeds on ZnO nanorod growth onto rigid substrates for photocatalytic abatement of Escherichia coli in water (Article)

Sanchez, L.^a, Guz, L.^b, García, P.^a, Ponce, S.^c, Goyanes, S.^d, Marchi, M.C.^e, Candal, R.^{b,e}, Estrada, W.^a, Rodriguez, J.^a ✉️ 👤

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Abstract

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ZnO nanorods (ZnO NRs) were grown on ZnO seeded fluorine doped tin oxide (FTO) substrates at low temperatures (90 °C) from Zn²⁺ precursors in alkaline aqueous solution. The ZnO seeds were deposited on the FTO substrate heated at 350 °C by spray pyrolysis of a zinc acetate solution in a water ethanol mixture. The structure of seeds was tuned by the ethanol water ratio, Γ , which controls the solvent evaporation rate of drops impinging the substrate. The relationship between the microstructure and optical properties of the ZnO NR films and the photocatalytic antibacterial activity for Escherichia coli abatement, was determined through a detailed characterization of the material. The higher photocatalytic antibacterial activity was performed by ZnO NR films grown on seeds deposited from solutions with Γ in the 0.0-0.03 range. With these films, the population of viable E. coli dropped more than six orders, from 8×10^8 to 4×10^2 CFU. These results show the potential of these materials in water disinfection. © IWA Publishing 2014.

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Author keywords

Nanorods Photocatalytic disinfection Spray pyrolysis ZnO

Indexed keywords

Engineering controlled terms:

Disinfection Doping (additives) Escherichia coli Ethanol Nanocomposites Nanorods
Optical properties Organic solvents Pyrolysis Spray pyrolysis Tin oxides Zinc
Zinc compounds Zinc oxide

Engineering uncontrolled terms

Anti-bacterial activity Fluorine doped tin oxide Photocatalytic disinfections Rigid substrates
Solvent evaporation Water disinfections Water ethanol mixtures ZnO

Engineering main heading:

Substrates

EMTREE drug terms:

alcohol nanorod tin oxide water zinc acetate zinc oxide

GEOBASE Subject Index:

aqueous solution catalysis film growth rate low temperature microbial community
microstructure optical property pyrolysis substrate temperature effect water quality zinc

EMTREE medical terms:

alkalinity antibacterial activity aqueous solution Article Escherichia coli evaporation
low temperature nonhuman photocatalysis pyrolysis structure analysis

Species Index:

Escherichia coli

Chemicals and CAS Registry Numbers:

alcohol, 64-17-5; tin oxide, 1332-29-2, 21651-19-4; water, 7732-18-5; zinc acetate, 557-34-6; zinc oxide, 1314-13-2

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
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