

ž ž ž ž

ü TiO₂/UV

naserise@tums.ac.ir

ly /y : y / / :

(Ag-TiO₂)

yy yi ymg/L

i pH

/ y / i y# g/L

Ag-TiO₂

Ag-TiO₂

y g/L Ag-TiO₂

pH:

yymg/L

fn / E

/ g/L

y g/L

n /

n

Ag-TiO₂

fl E

! ! ! ! !

UV-E
 (ZnO-E TiO₂-E)
 .(E " "

"fl E "fl E

TiO₂ " "

- mg/L
 " flÿnm E .(E
 TiO₂ "

Ô
 "flDopingE
 .(E " "

"fl E
 P25 TiO₂ " " Hombikat .(E
 "fl E
 Ô
 " TiO₂

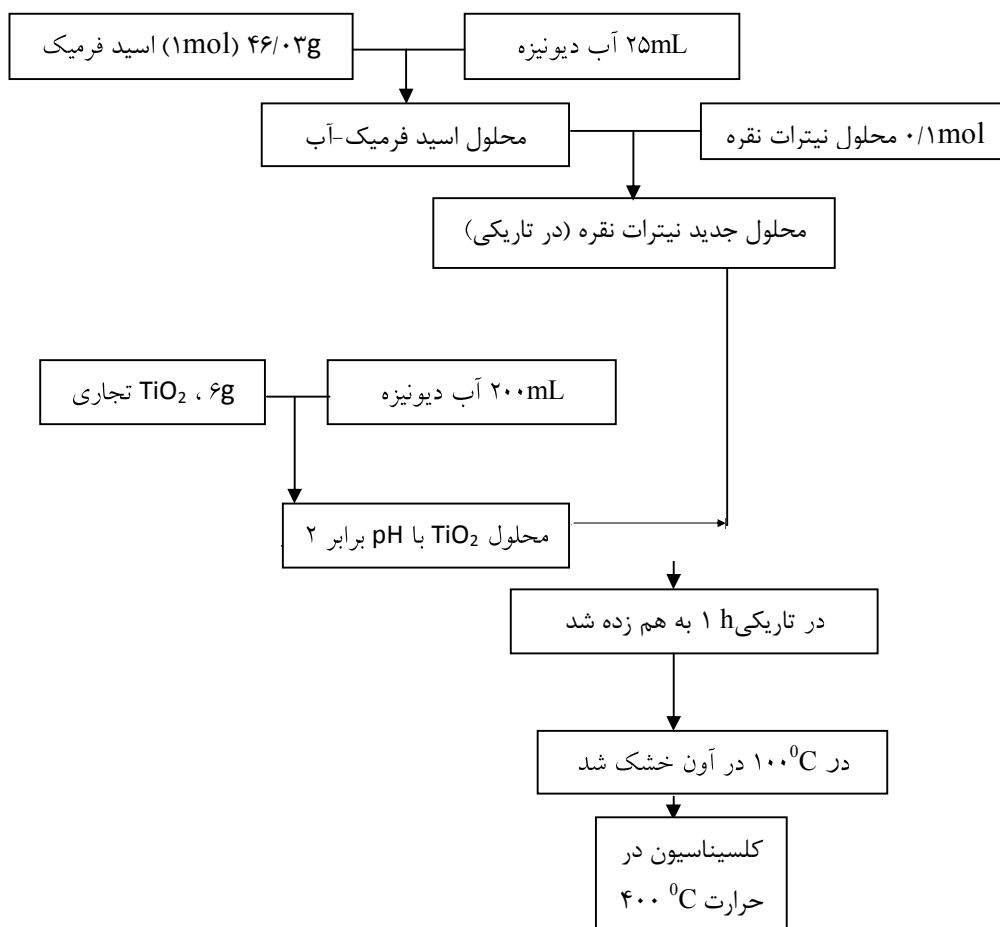
.(yE " "

fl E fl E (Photocatalytic DegradationE
 " "

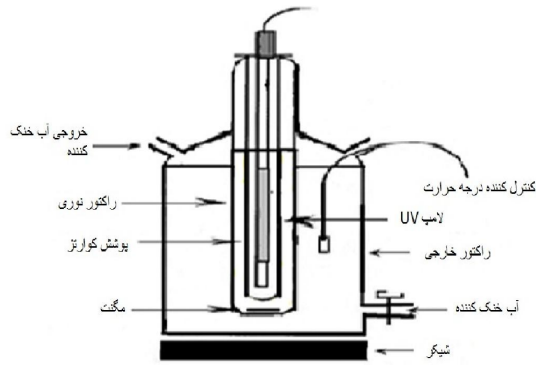
Ag-TiO₂ UV
 pH
 TiO₂ Ag-TiO₂ Degussa ,25
 TiO₂- Ag
 (Ag/Ti)
 Scanning Electron Microscope-Energy Dispersive)
 'Seron Technology AIS-2100' (X Ray (SEM-EDX
 'X' Pert MPD
 (Transmission
 'ZEISS-EM10C' Electron Microscopy (TEM)
 " KV (Accelerating voltage)
 Brunauer- Emmett- Ag-TiO₂
 Autosorb 1 Quantachrome Teller (BET
 nm
 fl

HCOOH
 Hole Scavenger
 Ag-TiO₂
 (Photodeposition
 Hydrothermal Sol-gel !
 Chemical Photoreduction
 " Vapor Deposition
 Swamiathan
 Tryba (DB53 DR23
 ç y
 (Shirzad Siboni
 y y
 UV/TiO₂
 pH
 pH= y min
 i mg/L g/L
 (n / n /
 Ghanbarian y
 UV TiO₂
 (n / LAS

NaOH pH
N·HCl N / L L
mg/L cm fl WL
cm ycm
min
rpm mg/L
μ
Perkin-Elmer Lambda
nm 15-UV/Vis Spectrometer pH=

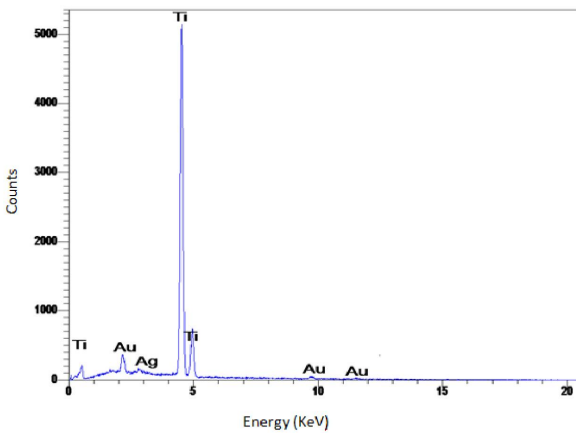


Ag-TiO₂



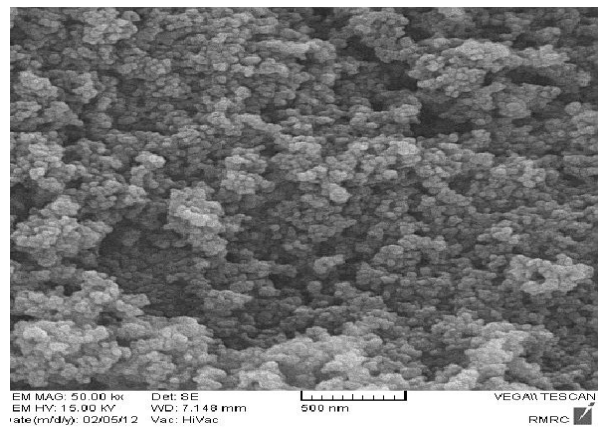
SEM-EDX
 Ti Ag (at%
 wt%
 Ag/TiO₂)
 Au
 TEM SEM
 (/ nm
 EXRD
 (/ Ag-TiO₂
 P25)
 BET (TiO₂ Degussa
 Ag-TiO₂
 TiO₂-P25 doped TiO₂
 Ag-TiO₂ ± m²/g TiO₂- P25
 / m²/g
 pH pH

Perkin-Elmer
 Lambda 25-UV/Vis Spectrometer Elmer
 (DR5000 nm
 Ag-TiO₂ UV
 UV
 pH
 Ag-TiO₂/UV
 UV
 SPSS16

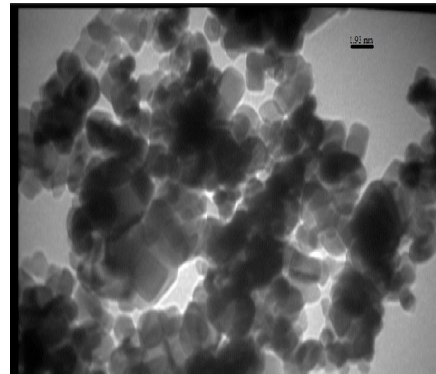
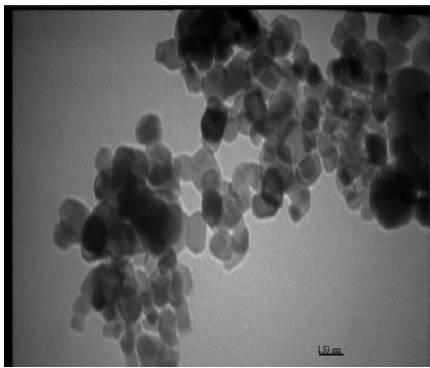


SEM-EDX

Ag-doped TiO₂ SEM-EDX

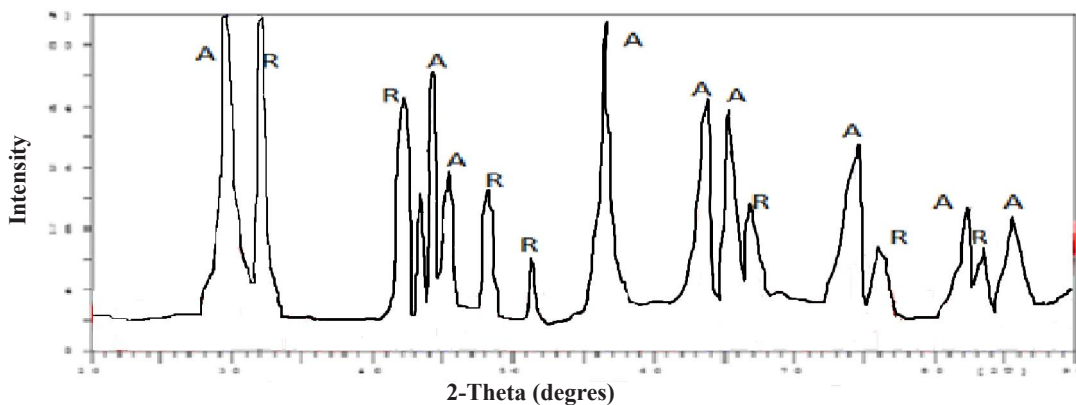


SEM

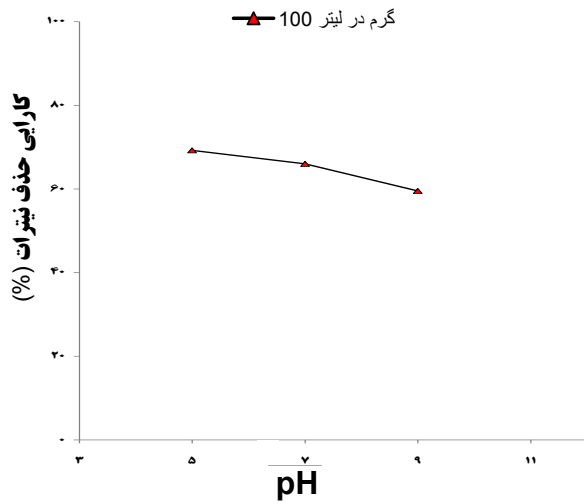


TEM

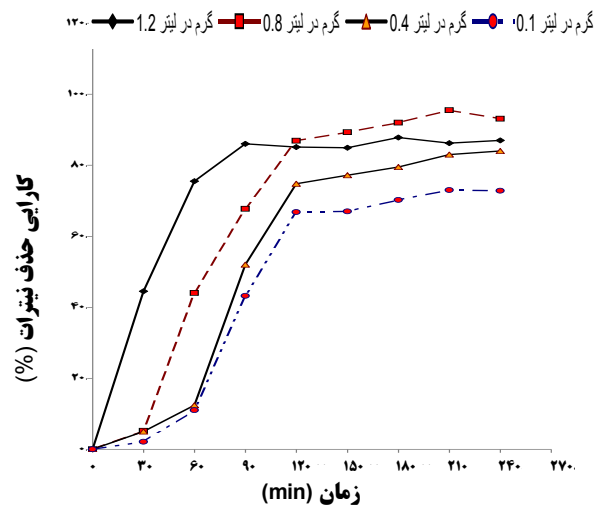
Ag-TiO ₂ / Ag-TiO ₂ /UV	Ag-TiO ₂	Ag-doped TiO ₂ /UV
0.25 mg/L	0.25 mg/L	0.25 mg/L
pH= 7	pH= 7	pH= 7
UV	UV	UV
Ag-TiO ₂ /UV	Ag-TiO ₂ /UV	Ag-doped TiO ₂ /UV
0.25 mg/L	0.25 mg/L	0.25 mg/L
pH= 7	pH= 7	pH= 7
UV	UV	UV



(2-Theta-Scale)



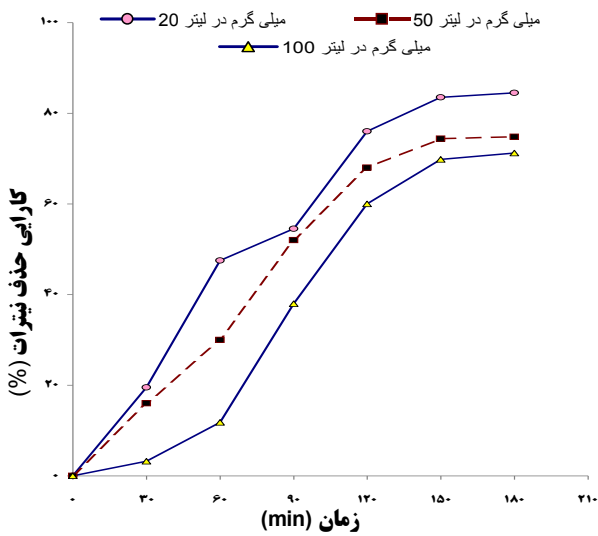
$C_0 = \dots \text{mg/L}$ $\text{pH} = \dots$
 $t = \dots \text{min}$ $\text{Ag-TiO}_2 = \dots \text{g/L}$: Ag-TiO₂/UV



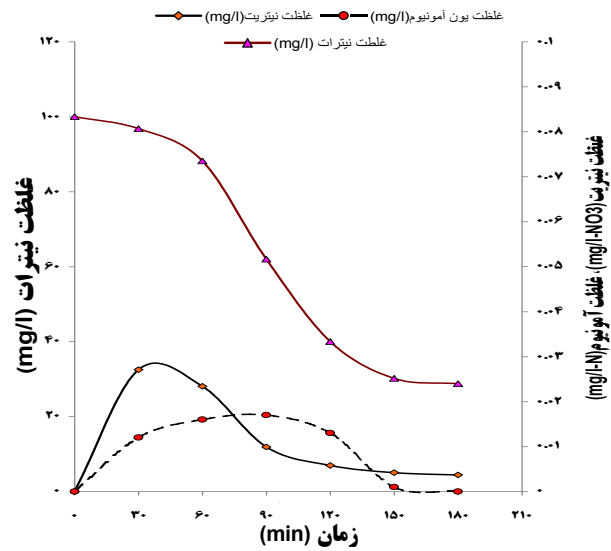
$\text{Ag-TiO}_2/\text{UV}$ $\text{pH} = \dots$ $C_0 = \dots \text{mg/L}$

Ag-doped TiO₂ Ti Ag "

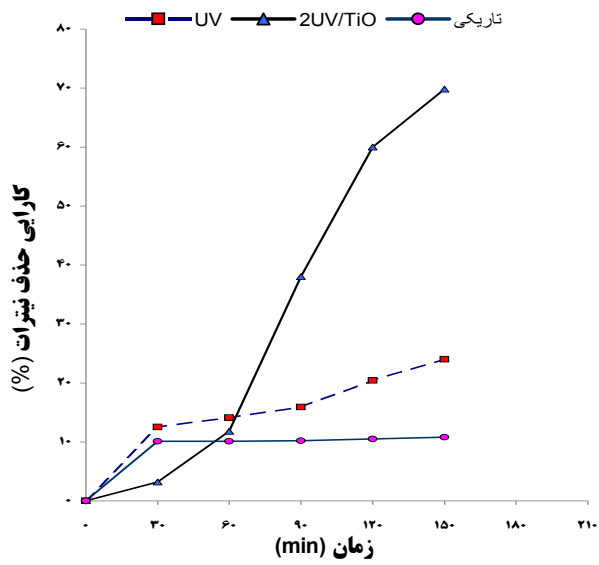
BET XRD TEM SEM-EDX
 Ag-doped TiO₂
 TEM
 / nm Ag-doped TiO₂
 TiO₂
 SEM-EDX / nm nm
 Ti Ag (at%) flwt%



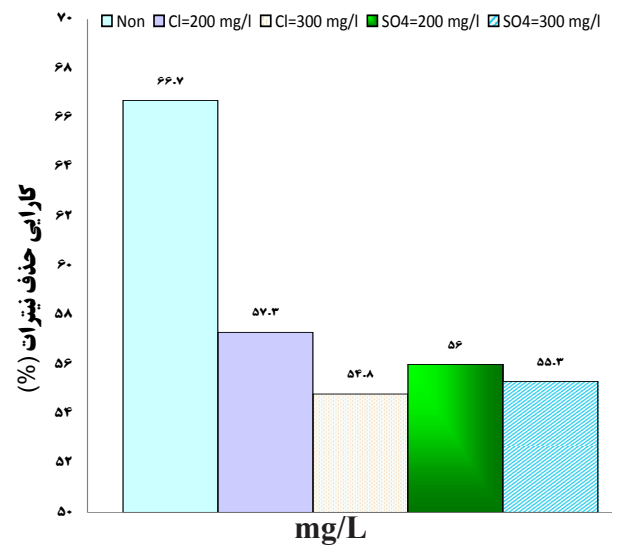
$\text{Ag-TiO}_2 = \dots \text{g/L}$ $\text{pH} = \dots$: Ag-TiO₂/UV



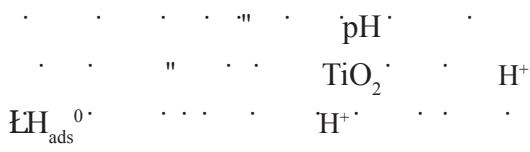
$\text{Ag-TiO}_2 = \dots \text{g/L}$, $\text{pH} = \dots$, $C_0 = \dots \text{mg/L}$: Ag-TiO₂/UV



UV Ag-TiO₂/UV
 Ag-TiO₂ = ̄/ g/L, pH= ·C₀ = ̄̄ mg/L



t = ̄ min
 Ag-TiO₂ = ̄/ g/L, pH= ·C₀ = ̄̄ mg/L



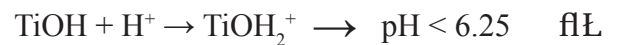
·pH " " pH
 Ranjit " " pH
 M-TiO₂ " " pH
 Ag-TiO₂ " " pH

TiO₂ P25

XRD

"fl E

Ag-TiO₂ ·BET
 TiO₂ / m²/g
 " fl ̄± m²/g P25
 Ag-TiO₂/UV pH
 j E pH
 pH =
 pH
 pH
 pH #L2 pH #L2 pH jL
 pH
 TiOH TiO₂
 !



سلامت و محیط

فصلنامه علمی پژوهشی انجمن علمی بهداشت محیط ایران
 دوره پنجم / شماره سوم / پاییز ۱۳۹۱

pH / g/L "fl - E
" " y/ g/L
" "
- E
Ag-TiO₂ fl
fl E " y " Yang "
Paracetamol E
TiO₂
E
" fl
" " fl E
y Guo
TiO₂
nm TiO₂
fl E Ranjit " fl E
" y/ g/L
n
" "
w pH E
fl E " fl
nm
E y Damodar .(y)
fl
" "
Ag-TiO₂
i ymin
" " ymin fl E
" "
" "
(E " "

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Photocatalytic Reduction of Nitrate in Aqueous Solutions using Ag-doped TiO₂/UV Process

Saeed Parastar¹, *Simin Nasser¹, Amir Hossein Mahvi¹, Mitra Gholami¹, Amir Hossein Javadi², Saeedeh Hemmati¹

¹Department of Environmental Health Engineering, Faculty of Health, Tehran University of Medical Sciences, Tehran, Iran

² Institute of Engineering of Jihad Keshavarzi, Tehran, Iran

Received; 03 March 2011 Accepted; 28 May 2011

ABSTRACT

Background and Objectives: Pollution of water resources to nitrate is an environmental problem in many parts of the world. This problem possibly causes diseases such as methemoglobinemia, lymphatic system cancer and Leukemia. Hence, nitrate control and removal from water resources is necessary. Considering that application of nanomaterials in treatment of environmental pollutants has become an interesting method, in this research use of Ag-doped TiO₂ nanoparticles synthesized through photodeposition produced under UV irradiation was studied for removal of nitrate from aqueous solutions.

Materials and Methods: Three nitrate concentrations of 20, 50, and 100 mg/L were considered. In order to determine the effect of Ag-doped TiO₂ nanoparticles on nitrate removal, dosages of 0.1, 0.4, 0.8 and 1.2 g/L nanoparticles were used; pH range of 5-9 was also considered. The effect of Ag-doped TiO₂ nanoparticles both in darkness and under UV irradiation was studied. Moreover, the presence of chloride and sulfate anions on the system removal efficiency was investigated.

Results: The optimum performance of nitrate removal (95.5%) was obtained using nitrate concentration of 100 mg/L, in acidic pH and 0.8 g/L Ag-TiO₂. Increase of nanoparticle dosage up to 0.8 g/L, increased the removal efficiency, but for 1.2 g/L dosage of nanoparticles, the removal efficiency decreased. Maximum reduction performance without nanoparticles, under UV irradiation and under darkness conditions were 32% and 23.3% , respectively. In addition, we found that presence of sulfate and chloride anions in aqueous solution reduced efficiency of nitrate removal.

Conclusion: Results of this study showed that Ag-doped TiO₂ nanoparticles may be efficiently used for nitrate removal from aqueous solutions.

Keywords: Photocatalytic reduction, Ag-doped TiO₂, Nitrate, Aqueous solutions

*Corresponding Author: naserise@tums.ac.ir

Tel: +98 21 88989133, Fax: +98 21 88989133