[illegible]
[illegible]
[illegible]

[illegible] TiO_2/UV

[illegible]
naserise@tums.ac.ir [illegible]

[illegible]

[illegible]

[illegible] (Ag-TiO_2) [illegible] mg/L [illegible] pH [illegible] g/L [illegible] Ag-TiO_2 [illegible] Ag-TiO_2 [illegible]

[illegible] mg/L [illegible] pH [illegible] g/L [illegible] Ag-TiO_2 [illegible] g/L [illegible] g/L [illegible]

[illegible] Ag-TiO_2 [illegible]

[illegible]

[illegible]

[illegible]

[illegible] (HCOOH) [illegible] (Hole Scavenger) [illegible] Ag-TiO$_2$ [illegible] (Photodeposition) [illegible] (Sol-gel) [illegible] (Hydrothermal) [illegible] Chemical) [illegible] (Photoreduction) [illegible] .(Vapor Deposition

[illegible] Swamiathan [illegible] Tryba [illegible] DR23 [illegible] DB53 [illegible]

[illegible] Shirzad Siboni [illegible] UV/TiO$_2$ [illegible] pH [illegible] pH= [illegible] min [illegible] mg/L [illegible] g/L [illegible]

[illegible] Ghanbarian [illegible] UV [illegible] TiO$_2$ [illegible] LAS [illegible]

[illegible] Ag-TiO$_2$ [illegible] UV [illegible] pH [illegible]

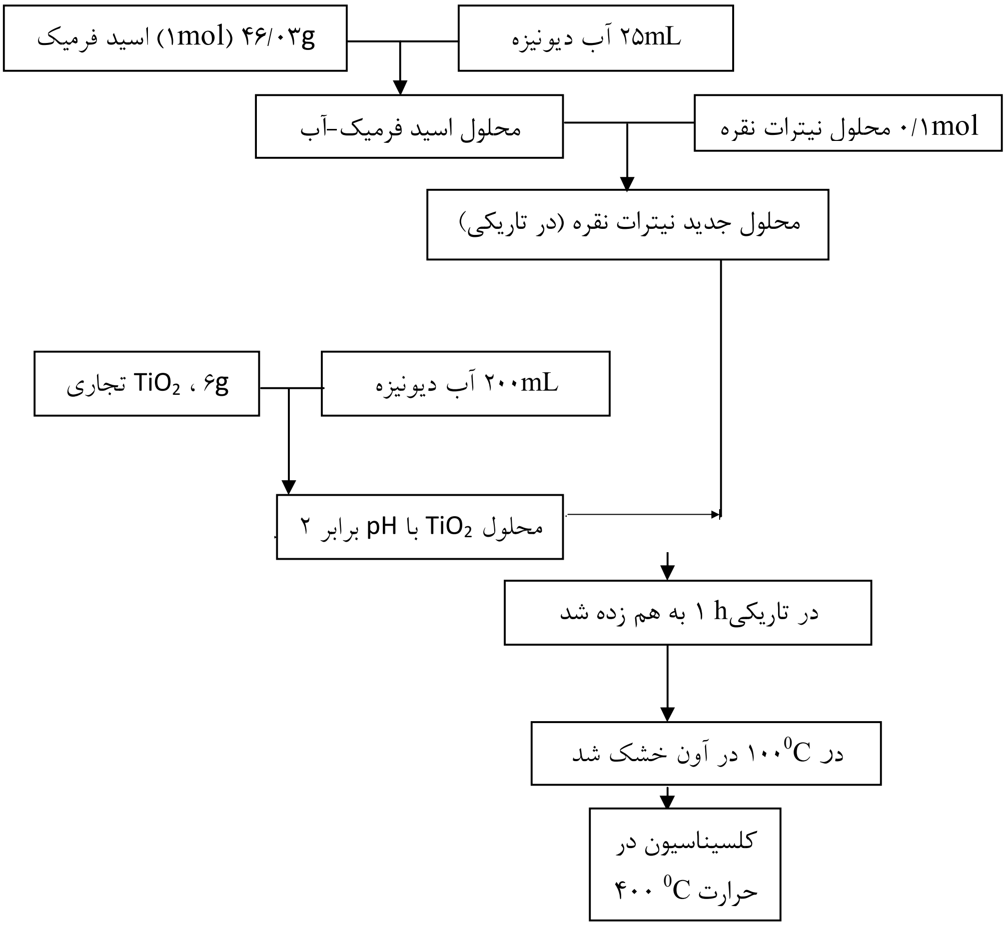
[illegible]

[illegible] TiO$_2$ [illegible] Ag-TiO$_2$ [illegible] Degussa ,25 [illegible]

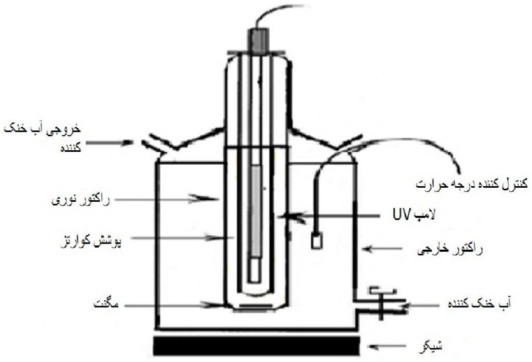
[illegible] TiO$_2$- Ag [illegible] (at%) [illegible] (Ag/Ti) [illegible] Scanning Electron Microscope-Energy Dispersive)) [illegible] Seron Technology AIS-2100 [illegible] (X Ray (SEM-EDX [illegible] X' Pert MPD [illegible] (Transmission [illegible] ZEISS-EM10C [illegible] Electron Microscopy (TEM)) [illegible] KV (Accelerating voltage) [illegible] Brunauer- Emmett- [illegible] Ag-TiO$_2$ [illegible] Autosorb 1 Quantachrome [illegible] Teller (BET) [illegible]

[illegible] nm [illegible]

[illegible]


۴۶/۰۳g (۱mol) اسید فرمیک
۲۵mL آب دیونیزه
محلول اسید فرمیک-آب
۰/۱mol محلول نیترات نقره
محلول جدید نیترات نقره (در تاریکی)
۶g ، TiO₂ تجاری
۲۰۰mL آب دیونیزه
محلول TiO₂ با pH برابر ۲
در تاریکی۱ h به هم زده شد
در ۱۰۰⁰C در آون خشک شد
کلسیناسیون در
حرارت ۴۰۰ ⁰C

[illegible] $Ag-TiO_2$



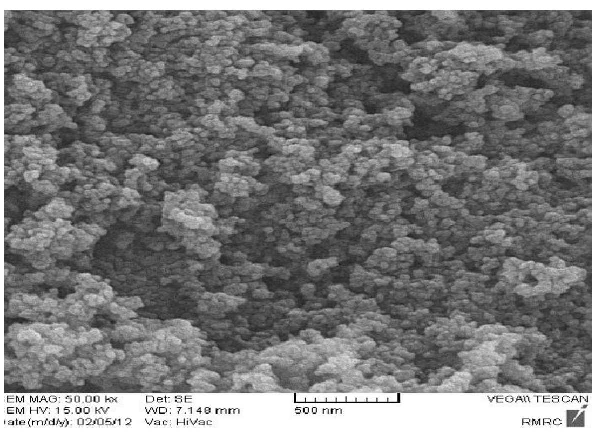
[illegible]

[illegible] Perkin-) [illegible] (Lambda 25-UV/Vis Spectrometer Elmer [illegible] nm [illegible] DR5000 [illegible].

[illegible] Ag-TiO_2 [illegible] UV [illegible] UV [illegible] pH [illegible] Ag-TiO_2/UV [illegible] UV [illegible] SPSS16 [illegible].

[illegible]

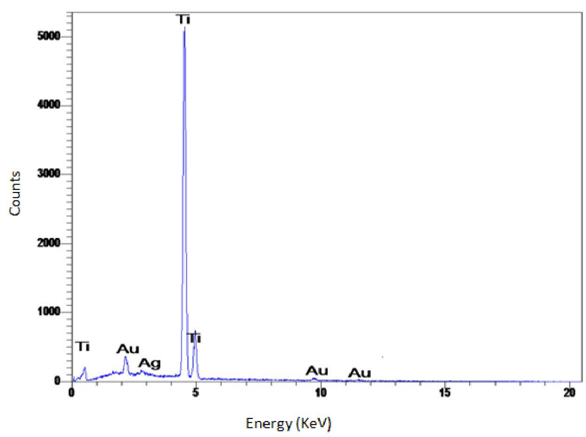
[illegible] SEM-EDX [illegible] Ag- doped TiO_2 [illegible]



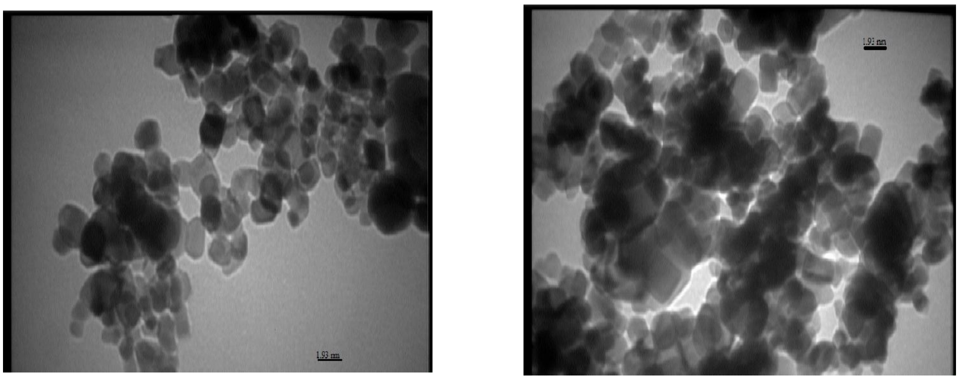
[illegible] SEM

[illegible] SEM-EDX [illegible] (wt%) [illegible] (at%) Ag [illegible] Ti [illegible] (Ag/TiO_2) [illegible] Au [illegible] SEM [illegible] TEM [illegible] nm [illegible] XRD [illegible] Ag-TiO_2 [illegible] (R) [illegible] (A) [illegible] P25) [illegible] (TiO_2 Degussa [illegible] BET [illegible] TiO_2 [illegible] Ag- [illegible] doped TiO_2 [illegible] TiO_2-P25 [illegible] m²/g [illegible] Ag-TiO_2 [illegible] TiO_2- P25 [illegible] m²/g [illegible].

[illegible] pH [illegible] pH [illegible]



[illegible] SEM-EDX [illegible]



ƮŬĨ: ƩƪƥƽǏ ƓƠ ƠƷƥ ƐƳƨƦ ƸƲ **TEM**

ƾ ǒǎƹƸ ƓƠ ƗƠƺƹƠǒƗ ƊǕǕ mg/L ƠƠƧǓ ƷƥƠ ƳƷƠƵ ƥƷƥƶƨ ƩƷƥƶƨ ƣƶƳƸ Ʒƥ pH=Ĩ (ĕĨĬ/Ĩ) ƥ pH=Ĩ (ĕĩĬ/Ʒ) ƷƓ ƥƷƷ ƠƠ.

ƮŬĨ ƩƪƨƧƥ ƳƥƥƨƵƤ ǜǠƾ Ag-TiO$_2$ ƷƫƸƥƶƨ ƪƬƨ ƗƠƺƹƠǒƗ ƷƥƶƤƤ ƩƷƥƶƨ ƣƓƶ. ƠƓƷƥƶƨ ƸƓƠƶƨ ƤƓƧƪƯ ƓƠƠƧǓ ƷƓ ƥƶƷƥƶƨ ƩƷƥƶƨ ƠƠ g/L Ʒ/Ʒ ƓƤƩƯƮ ƷƓ ƷƓƠƧǓ ƷƓ ƥƶƷƥƶƨ ƩƷƥƶƨ ƣƶƳƸ ƨƫƧƶƬ ƗƠƺƹƠǒƗ ƩƷƥƶƨ ƣƶƳƸ ƨƫƧƶƬ.

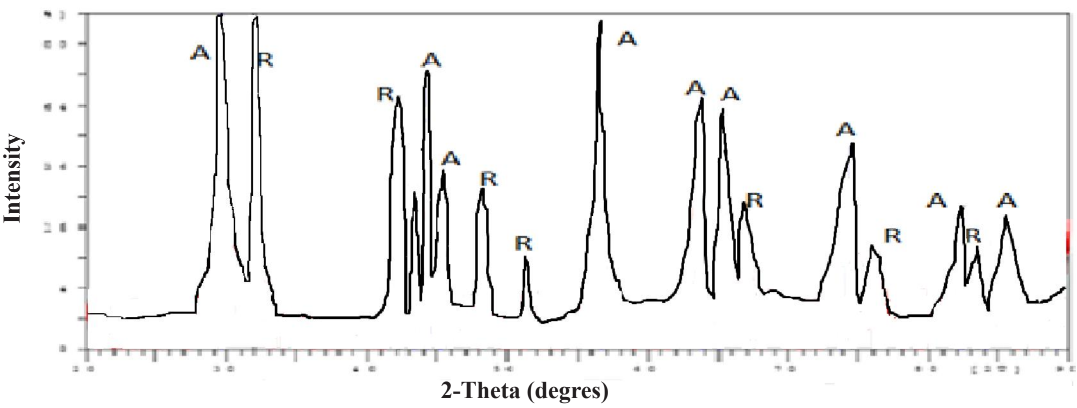
ƠǕƶ ƸƥƥƷǎ ƗƠƺƹƠǒƗ ƓƠƠƧǓ ƥƨƫƾǒǕ ƨƬƶƯ ƸƓƥƥƶ ƩƷƥƶƨ Ĩ ƮŬĨ ƷƥƠ ƓƷƥ ƩƷƥƶƨ Ag- doped TiO$_2$ /UV ƷƥƶƷƥƬ ƸƓƠƶƨ ƣƶƳƸ ƩƷƥƶƨ ƗƠƺƹƠǒƗ ƷƓƶƷƠƶƨ Ʒ ƣƶ ƠƸƥƠ ƸƠƶƨ ƠƓƸ ƨƾƶƬ ƮŬĨ ƷƓ ƷƓ ƠƠƸ ƥƥƸ. ƠƓƷƥƶƨ ƩƷƥƶƨ Ʒ ƠƓƷƥƶƨ ƗƠƺƹƠǒƗ ƩƷƥƶƨ ƣƶƳƸ ƩƸƶƨ ƨƬƶƯ ƓƠƠƧǓ ƗƠƺƹƠǒƗ ƩƷƥƶƨ ƣƶƳƸ ƠƓƷƥ. (ĕĩƷ/Ĩ) ƣƶƳƸ ƩƷƥƶƨ ƗƠƺƹƠǒƗ ƷƓ ƠƓƷƥ ƓƠƠƧǓ ƗƠƺƹƠǒƗ mg/L ƷƓ ƥƷ ƨƬƶƯ min ƗƊǕ ƷƓƷƥ ƷƥƤƶ.

ƥ ƠƓƷƥ ƨƬ ƷƥƠƠ ƗƠƺƹƠǒƗ ƓƠƠƧǓ ƊǕƮŬĨ ƓƠ ƓƤƥƩ ƸƓ ƓƠƠƧǓ ƗƠƺƹƠǒƗ ƥ ƠƧƳƥƥƩ ƷƷƥƷƶƹ ƓƠ ƥƷƥƶƬƩ ƗƠƺƹƠǒƗ ƓƠƠƧǓ ƓƠ ƷƓ (ƠƠƸ ƥƷƥƶ ƨƫƧƶƬ ƵƷƶƶ ƗƠƺƹƠǒƗ ƓƠƠƧǓ ƷƓ (ƓƠƠƧǓ ƗƠƺƹƠǒƗ ƥ ƳƠ ƩƷƥƶƨ ƓƠƠƧǓ ƓƠƠƧǓ ƷƓ ƠƓƷƥ ƸƓ ƠƠƸ (ƓƸƥƥƶƨ ƷƥƷƶƹ ƥƷƥƶƬƩ ƠƠƸƥƥƷƶ.

ƓƠ ƷƓ ƩƷƥƶƨ ƗƠƺƹƠǒƗ ƩƷƥƶƨ ƣƶƳƸ ƩƷƥƶƨ ƣƶƳƸ ƥƷƥƶƬƩ ƗƠƺƹƠǒƗ ƩƷƥƶƨ ƣƶƳƸ pH ƥƷƥƶƨ ƥ ƩƷƥƶƬƩ ƩƷƥƶƨ ƓƷ ƥƥƥ ƷƓ ƓƠ ƷƥƷƶƹ ƓƠ ƷƓ ƸƶƠ ƩƷƥƶƨ ƣƶƳƸ pH=Ĩ ƷƓƷƥ ƸƓƠƥƷƥƶƨ.

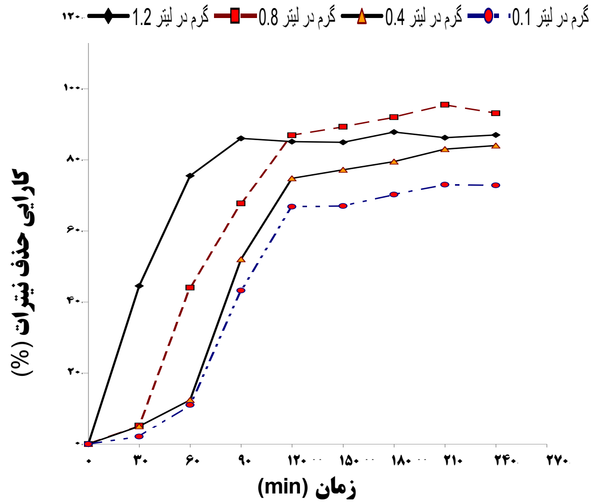
Ag-TiO$_2$ ،Ag-TiO$_2$/UV ƷƓƷƥƶƬƩ ƩƷƥƶƨ ƓƤƥƶƨ ƸƸ ƮŬĨ ƓƠ ƗƠƺƹƠǒƗ ƊǕǕmg/L ƠƠƧǓ ƷƓ ƩƷƥƶƬƩ ƓƠ UV ƥ ƩƷƥƶƨ ƷƓ ƷƓƷƠƥƠƷƥ ƩƷƥƶƨ ƓƠ ƥƷƥƶƬƩ ƓƠ ƷƓ ƥƷƥƶƨ ƷƓƷ ƠƓƷƥƶƨ ƓƠ ƷƥƶƤ ƓƠ ƮŬĨ ƣƶƳƸ Ag-TiO$_2$/UV ƓƠ ƠƷƥ.

ƗƠƺƹƠǒƗ ƣƶƳƸ ƩƷƥƶƨ ƓƠ ƓƤƥƶƨ ƥƷƥƶƨ ƓƠƷ ƥƷƥƶƨ ƸƸ ƮŬĨ ƷƓ ƷƓ ƠƠƸ ƷƷƸƥƶƨ ƮŬĨ ƷƓ ƓƠ ƷƷƷ ƷƓƷƥ .ƠƷƥ ƷƥƷ ƓƠƠƧ ƗƠƺƹƠǒƗ ƣƶƳƸ ƩƷƥƶƨ ƥƷƥƶƨ ƷƷ ƊǕǕ ƥ ƊǕǕ mg/L ƠƠƧǓ ƥƷ ƥƷƥƶƨ ƷƶƶƳƸ ƷƷƥƶ ƠƶƠƸ ƓƠ ƠƶƷƥ ĕĨƊ/Ĩ ƥ ĕĨ/Ʒ ƾ ǒǎƹƸ ƓƠ ƊǕǕ ƥ ƊǕǕ mg/L ƠƠƧǓ ƥƷ ƷƓ ƷƠƥ ƸƷƥ .ƠƷƥ ƓƠƥƶƨ ƸƸ ƗƠƺƹƠǒƗ ƣƶƳƸ ƩƷƥƶƨ ĕƊƊ ƥ ĕƊƊ/Ĩ ƾ ǒǎƹƸ ƓƠ ƷƠƥ ƗƠƠƷƥƶ ƷƷƷ ƠƓƷƥƶƨ ƠƷƥ ƓƠ ƠƷƥ ƓƠƥƶƨ ƸƸ ƗƠƠƷƥƶ ƷƷƥƶ ƠƶƠƸ ƓƠ ƠƶƷƥ.

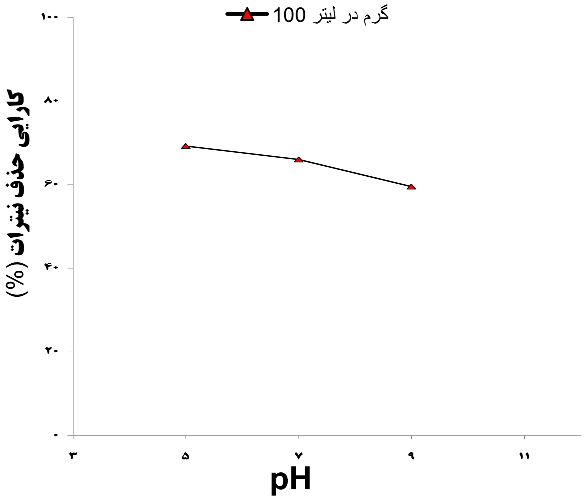


(2-Theta-Scale) ƷƠƥ ƓƠƠƸ ƥ ƠƷƥ ƣƶƳƸ :ƨ ƮŬĨ

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



[illegible] :Ag-TiO$_2$/UV [illegible] pH=[illegible] ؛C$_0$= [illegible]mg/L



[illegible] pH [illegible] C$_0$= [illegible]mg/L [illegible] t=[illegible]min؛Ag-TiO$_2$= [illegible]g/L :Ag-TiO$_2$/UV

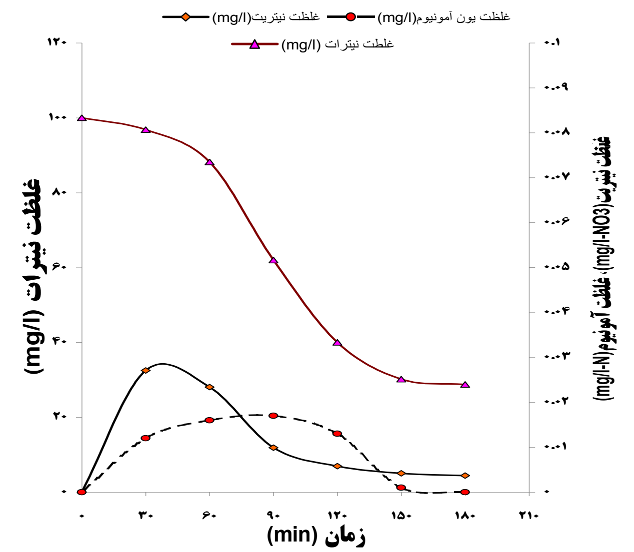
[illegible]

[illegible] SEM-EDX، TEM، XRD و BET [illegible] Ag- doped TiO$_2$ [illegible]

[illegible] TEM [illegible] Ag- doped TiO$_2$ [illegible] nm [illegible] TiO$_2$ [illegible] SEM-EDX [illegible] nm [illegible] (wt%) [illegible] Ag (at%) [illegible] Ti [illegible]

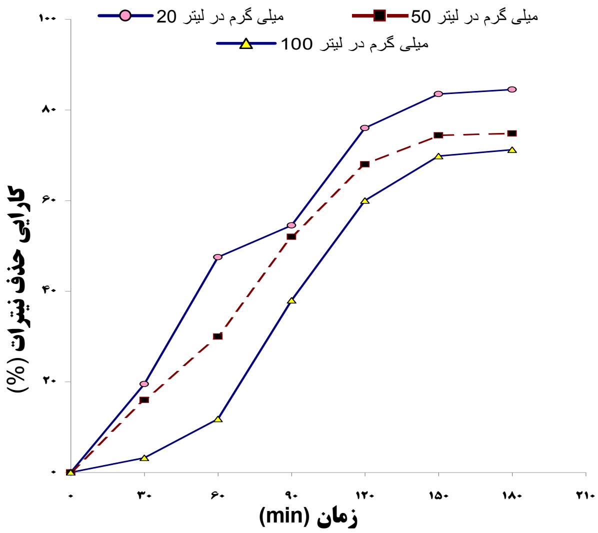
Ag- doped TiO$_2$ [illegible] Ti [illegible] Ag [illegible]

[illegible]



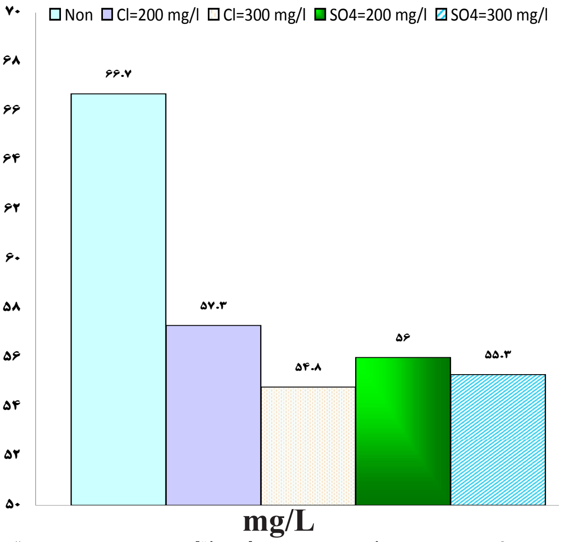
[illegible]

Ag-TiO$_2$= [illegible]g/L ،pH=[illegible] ،C$_0$= [illegible] mg/L : Ag-TiO$_2$/UV

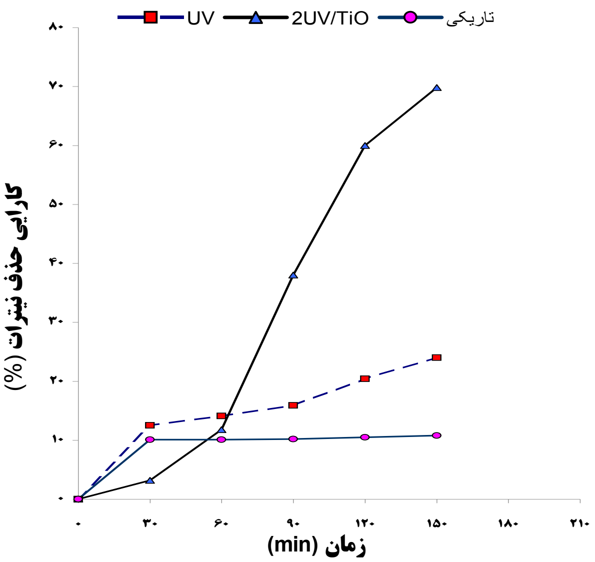


[illegible]

Ag-TiO$_2$= [illegible]g/L ؛pH=[illegible]: Ag-TiO$_2$/UV



t= min: … Ag-TiO$_2$= g/L ،pH= ،C$_0$= mg/L



Ag-TiO$_2$/UV … UV … Ag-TiO$_2$= g/L ،pH= ،C$_0$= mg/L

… TiO$_2$ P25 … XRD … Ag-TiO$_2$ … BET … m^2/g … TiO$_2$ … P25 … m^2/g …

Ag-TiO$_2$/UV … **pH** … (pH = …) … pH … pH … pH … pH … pH … (TiOH) … TiO$_2$ …

$$TiOH + H^+ \rightarrow TiOH_2^+ \longrightarrow pH < 6.25$$

$$TiOH \rightarrow TiO^- + H^+ \longrightarrow pH > 6.25$$

… pH … H^+ … TiO$_2$ … H^+ … H_{ads}^0 … pH … pH … Ranjit … M-TiO$_2$ … pH …

… **Ag-TiO$_2$** …

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

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Photocatalytic Reduction of Nitrate in Aqueous Solutions using Ag-doped TiO_2/UV Process

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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 TiO_2 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 TiO_2 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 TiO_2 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-TiO_2. 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 TiO_2 nanoparticles may be efficiently used for nitrate removal from aqueous solutions.

Keywords: Photocatalytic reduction, Ag-doped TiO_2, Nitrate, Aqueous solutions

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