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Data Article

Data on bioassay of toxicity reduction of treated textile wastewater by using nanophotocatalytic process by *Daphnia magna*

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A R T I C L E I N F O

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A B S T R A C T

Practicability and possibility of photocatalytic degradation of Ro16 textile dye and the actual wastewater of textile were studied on pilot scale. The amount of reduction in solution toxicity was studied and assessed by the application of a bioassay using *Daphnia magna*. The solution toxicity at the beginning of the process has an increasing procedure and this is caused by the intermediate products that are produced during the photocatalytic process from the mother compounds, and are more toxic compared to them, and their toxicity declines at the end of the process with the completion of mineralization. The procedure of toxicity increase and its decrease in the course of photocatalytic process has a direct relation with the amount of mineralization.

Specifications table

Subject area	Environmental pollution
More specific subject area	Industrial wastewater monitoring
Type of data	Figure
How data was acquired	Taking samples and conducting the toxicological tests and analyzing the results of the data
Data format	Analyzed

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Experimental factors	Detoxification of industrial wastewater and mortality of *Daphnia* in different time intervals
Experimental features	Upon sampling and analyzing the obtained data, the comparative results of *Daphnia* mortality are shown in the figures, and the toxicity is evaluated.
Data source location	*Baft Azadi* textile factory and the laboratory
Data accessibility	Data are available in the article
Related Research	A.H. Mahvi, A. Maleki, M. Alimohammadi, A. Ghasri, Photo-oxidation of phenol in aqueous solution: Toxicity of intermediates, Korean Journal of Chemical Engineering, 24 (2007) 79–82

Value of the data

- Detoxification of textile wastewater from reactive dyes using photocatalytic processes can help to have better quality of treated wastewater for agricultural, breeding fish or feeding groundwater.
- Mortality rate of *Daphnia* indicated whether detoxification of textile wastewater is successful or not?
- Monitoring of the treated wastewater is one of the most important applied and practical aspects of the procedure.

1. Data

Nowadays, among the methods of toxicity monitoring and tracing, bioassay with *Daphnia*, as a result of its specific characteristics, is one of the most common methods. The purpose of this experiment was the specification of toxicity reduction of synthetic solution of RO 16 dye and 2 real textile wastewater samples at different times in the course of photocatalytic reaction by TiO_2. Synthetic solutions of RO 16 dye and real "*Bafte Azadi*" textile wastewater were treated by photocatalytic process using nano-particles of TiO_2 in a reactor. After treatment process, the nanoparticles of TiO_2 were separated by filtering after centrifuge in 6000 rpm for each sample. The treated samples were exposed to toxicity tests. In each sample tube and each control tube, 10 daphnia infants were placed. The concentration of the toxic substance in the control cell was 0. The monitoring and evaluation of the sample tube contained *Daphnia*, were performed regularly and accurately after 24, 48, 72, 96 hours and also during different irradiation time of 30, 60, 120, 180 and 240 min. The number of stagnant daphnia was recorded in each experiment. All the tests were done with 10 live *Daphnia*. The results of this monitoring and evaluation are shown in Figs. 1–3. Vector y represents the number of

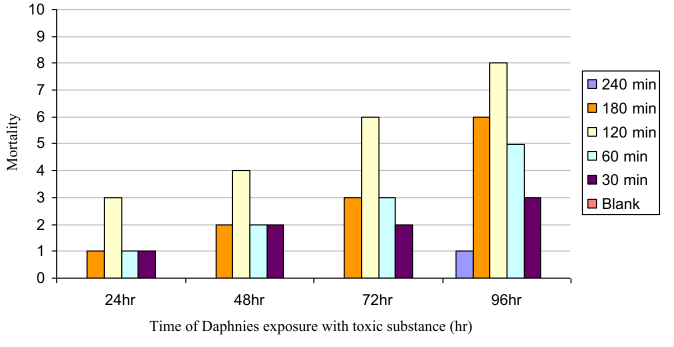

Fig. 1. Daphnia mortality rate in synthetic solution RO 16.

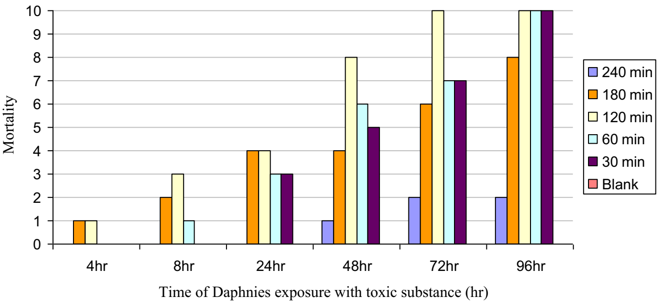

Fig. 2. Daphnia mortality rate in real textile wastewater sample No.1.

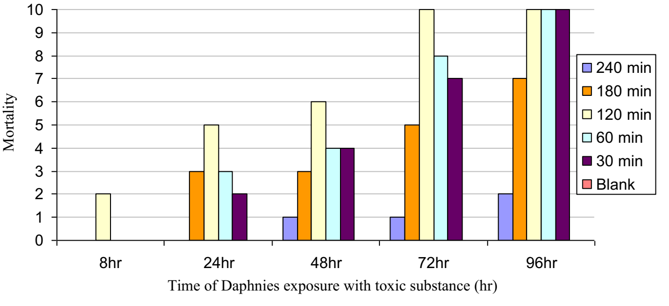

Fig. 3. Daphnia mortality rate in real textile wastewater sample No.2.

dead *Daphnia* and vector x represents time of *Daphnia* exposure to treated wastewater which is grab in different photocatalytic process time.

Nowadays, there are a few textile wastewater treatment processes with logical efficiencies in use by industries [1–13]. One of the processes which is able to deal with the degradation problems of dyes in aqueous solutions is Advanced Oxidation Processes (AOPs). AOPs react on the base of the production of very active hydroxyl radicals OH● which oxidize a vast range of pollutants fast and non-selectively. Among AOPs, it seems that the heterogeneous photo catalytic process using TiO_2 as a catalyst is a more destructive technology [14–16]. RO 16 has a maximum absorption in 497 nm visible area. It is evident that the conduction band electrons (e^-) and the valence band holes (h^+) are formed when the aqueous suspension of TiO_2 irradiates with an energy lower than its own band-gap energy (3.2 ev.Eg) [1,17].

2. Experimental design, materials and methods

2.1. Reagent

In this paper, Reactive Orange 16 was provided by "*Alvan Sabet*" company in Iran. Reactive Orange 16 (C.I. 17757) (R3R) is a reactive dye bearing an azo group as chromophore and a sulphatoethylsulfone as the reactive group. Titanium dioxide (Degussa P25) was utilized as a photocatalyst. Its main physical data are as follow: average primary particle size around 21 nm, purity ~ 99.5% and BET surface area $50 \pm 15\ m^2\ g^{-1}$. A *UV-C* 18 W lamp (Philips) was used as irradiation source.

2.2. Photocatalytic reactor

Experiments were carried out in a batch mode immersion rectangular photocatalytic reactor made of glass. An 18 W low pressure mercury lamp was placed in the center of the photocatalytic reactor as the UV irradiation source that protected by quartz jacket. The slurry composed of dye solution and catalyst placed in the reactor was placed on a magnetic stirrer and stirred magnetically. Samples after photocatalytic treatment were centrifuged (6000 rpm, 10 min) and were filtered through Millipore filter (0.45 μm) membrane. Photocatalytic degradation processes were performed using a 2.3 L solution containing specified concentration of selected dye. Samples were withdrawn from sample point at certain time intervals and analyzed for detoxification rate by using *Daphnia* bioassay.

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Transparency document. Supporting information

Transparency data associated with this article can be found in the online version at https://doi.org/10.1016/j.dib.2018.10.143.

References

[1] A. Maleki, A.H. Mahvi, R. Ebrahimi, Y. Zandsalimi, Study of photochemical and sonochemical processes efficiency for degradation of dyes in aqueous solution, Korean J. Chem. Eng. 27 (2010) 1805–1810.
[2] S.D. Ashrafi, S. Rezaei, H. Forootanfar, A.H. Mahvi, M.A. Faramarzi, The enzymatic decolorization and detoxification of synthetic dyes by the laccase from a soil-isolated ascomycete, Paraconiothyrium variabile, Int. Biodeterior. Biodegrad. 85 (2013) 173–181.
[3] F. Gholami-Borujeni, A.H. Mahvi, S. Nasseri, M.A. Faramarzi, R. Nabizadeh, M. Alimohammadi, Enzymatic treatment and detoxification of acid orange 7 from textile wastewater, Appl. Biochem. Biotechnol. 165 (2011) 1274–1284.
[4] F. Gholami-Borujeni, A.H. Mahvi, S. Nasseri, M.A. Faramarzi, R. Nabizadeh, M. Alimohammadi, Application of immobilized horseradish peroxidase for removal and detoxification of azo dye from aqueous solution, Res. J. Chem. Environ. 15 (2011) 217–222.
[5] M. Shirmardi, A. Mesdaghinia, A.H. Mahvi, S. Nasseri, R. Nabizadeh, Kinetics and equilibrium studies on adsorption of acid red 18 (Azo-Dye) using multiwall carbon nanotubes (MWCNTs) from aqueous solution, E-J. Chem. 9 (2012) 2371–2383.
[6] S.S. Mirzadeh, S.M. Khezri, S. Rezaei, H. Forootanfar, A.H. Mahvi, M.A. faramarzi, Decolorization of two synthetic dyes using the purified laccase of *Paraconiothyrium variabile* immobilized on porous silica beads, J. Environ. Health Sci. Eng. (2014) 6.
[7] E. Bazrafshan, F.K. Mostafapour, A.R. Hosseini, A. Raksh Khorshid, A.H. Mahvi, Decolorisation of reactive red 120 dye by using single-walled carbon nanotubes in aqueous solutions, J. Chem. (2013) 938374.
[8] E. Bazrafshan, M.R. Alipour, A.H. Mahvi, Textile wastewater treatment by application of combined chemical coagulation, electrocoagulation, and adsorption processes, Desalin. Water Treat. 57 (2016) 9203–9215.
[9] E. Bazrafshan, F. Kord Mostafapour, S. Rahdar, A.H. Mahvi, Equilibrium and thermodynamics studies for decolorization of Reactive Black 5 (RB5) by adsorption onto MWCNTs, Desalin. Water Treat. 54 (2015) 2241–2251.
[10] M. Shirmardi, A.H. Mahvi, A. Mesdaghinia, S. Nasseri, R. Nabizadeh, Adsorption of acid red18 dye from aqueous solution using single-wall carbon nanotubes: kinetic and equilibrium, Desalin. Water Treat. 51 (2013) 6507–6516.
[11] S.D. Ashrafi, H. Kamani, A.H. Mahvi, The optimization study of direct red 81 and methylene blue adsorption on NaOH-modified rice husk, Desalin. Water Treat. 57 (2016) 738–746.
[12] A.H. Mahvi, M. Ghanbarian, S. Nasseri, A. Khairi, Mineralization and discoloration of textile wastewater by TiO_2 nanoparticles, Desalination 238 (2009) 309–316.
[13] A. Dalvand, R. Nabizadeh, M.R. Ganjali, M. Khoobi, S. Nazmara, A.H. Mahvi, Modeling of Reactive Blue 19 azo dye removal from colored textile wastewater using L-arginine-functionalized Fe_3O_4 nanoparticles: optimization, reusability, kinetic and equilibrium studies, J. Magn. Magn. Mater. 404 (2016) 179–189.
[14] N.M. Mahmoodi, M. Arami, N. Yousefi Limaee, N. Salman Tabrizi, Kinetics of heterogeneous photocatalytic degradation of reactive dyes in an immobilized TiO_2 photocatalytic reactor, J. Colloid Interface Sci. 295 (2006) 159–164.
[15] M. Stylidi, D.I. Kondarides, X.E. Verykios, Pathways of solar light-induced photocatalytic degradation of azo dyes in aqueous TiO_2 suspensions, Appl. Catal. B: Environ. 40 (2003) 271.
[16] A.H. Mahvi, A. Maleki, M. Alimohammadi, A. Ghasri, Photo-oxidation of phenol in aqueous solution: toxicity of intermediates, Korean J. Chem. Eng. 24 (2007) 79–82.
[17] N.M. Mahmoodi, m. Arami, N. Yousefi Limaee, K. Gharanjig, F. Normohammadian, Photo-oxidation Nanophotocatalysis using immobilized titanium dioxide nanoparticle: study of Butachlor, Materials Research Bulletin. 42 (5) (2007) 797–806.