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RSM BASED MODELING OF NITRATE REMOVAL FROM DRINKING WATER USING NANO-PHOTOCATALYST PROCESS

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Since the operating cost increased, the need to utilizing modeling tools have been growing to achieve standards over a wide range of operating conditions. Optimization based on past information, give opportunity to save energy as well as reducing construction, operation and maintenance cost which is one of the most important current priority of environmental engineers. Today on the other hand, nitrate removal from drinking water is another priority of environmental experts due to harmful effects on health including cancer, Methemoglobinemia, adverse reproductive effects and etc. Thus finding an effective optimized option to achieve this goals may be extremely helpful.

For this purpose TiO_2 nano-photocatalyst was utilized to treatment of drinking water containing nitrate. Experimental structure design and optimization of responses as well as variables was done by design expert software (version 8) and RSM based central composite design (CCD) approach. To do this reaction Time (T) = 15-180 min, pH=5-9 and Nano-photocatalyst dosage (D) =0.5-1.5 g/L were chosen as independent variables and NO_3 removal was chosen as dependent output response. Nearly 20 runs were developed through CCD for experiment and modelling of results. In order to finding the statistical significance of models and real data F-test ANOVA was utilized.

The amount of P>F less than 0.0001 showed that the obtained model is appropriate for simulation and modelling of nitrate removal from drinking water by nano-photocatalyt.

Result showed that TiO_2 could successfully remove 97.38 % of NO_3 in D=2.5 gr/l, T=180 min, pH =5 (maximum performance) and 36.84 % of NO_3 in D=0.5 gr/l, T=15 min, pH =9 (minimum performance). It can easily found from result that there is a direct relationship between pH, D, T and removal efficiency. The optimum condition of photocatalytic NO_3 removal was achieved equal to; D=1.85 gr/l, T=20 min and pH =7 for 70% removal efficiency and meet standards by using RSM based developed models. Finally photocatalytic NO_3 removal was assessed as a very appropriate method in order to meet environmental requirements, rapid and effective treatment, therefore strongly suggested for practical use.

Keywords— *Modeling, Nitrate, Nano-Photocatalyst, Response Surface Methodology, water.*

Recent Publications

1. **Javid, A.H., Hassani, A. H., Ghanbari, B* and Yaghmaeian, K. The feasibility of utilizing the moving bed biofilm reactor in order to upgrade and retrofit the municipal wastewater treatment plants. International Journal of Environmental Research,7 (2013) 963-972**
2. **Amir Hessam Hassani, Seyed Mehdi Borghei, Hassan Samadyar and Bastam Ghanbari*. Utilization of moving bed biofilm reactor for industrial wastewater treatment containing Ethylene Glycol: Kinetic and performance study. Environmental Technology, 35 (2013), 499–507**
3. **Maryam Faridnasr, Bastam Ghanbari* and Ardavan Sassani; Optimization of the moving-bed biofilm sequencing batch reactor (MBSBR) to control aeration time by kinetic computational modeling: Simulated sugar-industry wastewater treatment. Bioresource technology 208 (2016): 149-160.**

Biography

Bastam Ghanbari graduated in Environmental Engineering–Water and Wastewater from Islamic Azad University, Science and Research Branch (Tehran) at the age of 27. He is instructor of Department of Environmental Health Engineering, Islamic Azad University Tehran Medical Sciences Branch. He also has been Founder and researcher of Water Purification Research Center (WPRC) since 2014. Nearly 20 research projects has been carried out under his supervision in his research's interest area up to now including: Emerging contaminants, Novel batch bioreactors, Novel Biological Nutrient Removal (BNR) systems, Novel integrated bioreactors, Kinetic modelling of biological systems, Utilization of artificial neural network (ANN) to bioreactor modelling, Utilization of response surface methodology (RSM) to bioreactor modelling, Bioreactor computational modeling and optimization, Advanced Oxidation Process (AOPs) integrated Nano photo catalyst, Toxic wastewater treatment.

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