

SIIC010

REMOVAL OF Cr AND Zn USING AgNP_s / TiO₂ NANOCATALYST

Abdul Muhaimin Abd Jalil¹ and Norain Isa²

¹Faculty of Chemical Engineering, Universiti Teknologi MARA Pulau Pinang, 13500
Permatang Pauh, Pulau Pinang Malaysia

²Faculty of Chemical Engineering, Universiti Teknologi MARA Pulau Pinang, 13500
Permatang Pauh, Pulau Pinang Malaysia

*Corresponding author: norain012@ uitm.edu.my

Abstract:

Presently, water pollution is increasing by years. Water pollution is occur when there is pollutant or foreign substance contain in the water that decrease the quality of water and become toxic to living organism. One of the major causes that lead to water pollution are heavy metals. Heavy metals is the toxic substance even though at low concentration that can cause adverse effect. The objective of this research are to synthesis and characterize of titanium dioxide nanotubes (TNTs) decorated with silver nanoparticles (AgNPs) and to evaluate the removal of zinc and chromium ions by using the TNTs / AgNPs catalyst with different contact time and initial concentration of Cr and Zn ions. In this research, the TNTs were prepared by using anodisation process at constant 60 V for 20 minutes and by using EG / NH₄F / K₂CO₃ as electrolyte. Besides, the AgNPs were prepared by using salt reduction method with chemicals AgNO₃, *K. brevifolia* extract and NaOH. Next, the TNTs / AgNPs were prepared by using wet impregnation method. Lastly, the removal of chromium and zinc ions were remove by putting the TNTs / AgNPs into each different concentrations which are 5 ppm and 10 ppm. Furthermore, the characterization of the, TNTs, AgNPs and TNTs / AgNPs were done by using Field Emission Scanning Electron Microscopy (FESEM), and Energy Dispersive X-ray Analysis (EDX) and for zinc and chromium ion removal were analysing it by using Inductively Coupled Plasma – Optical Emission Spectrometry (ICP-OES). From the result obtained, TNTs / AgNPs has high efficiency for the removal of Zn ions since the percentage removal of 5 ppm and 10 ppm were 90.81% and 37.16% for Zn ions while percentage removal of 5 ppm for Cr ions was 9.53% respectively. Apart from that, the performance of Zn ions removal by using TNTs / AgNPs are better compared to Cr ions removal under visible light condition.

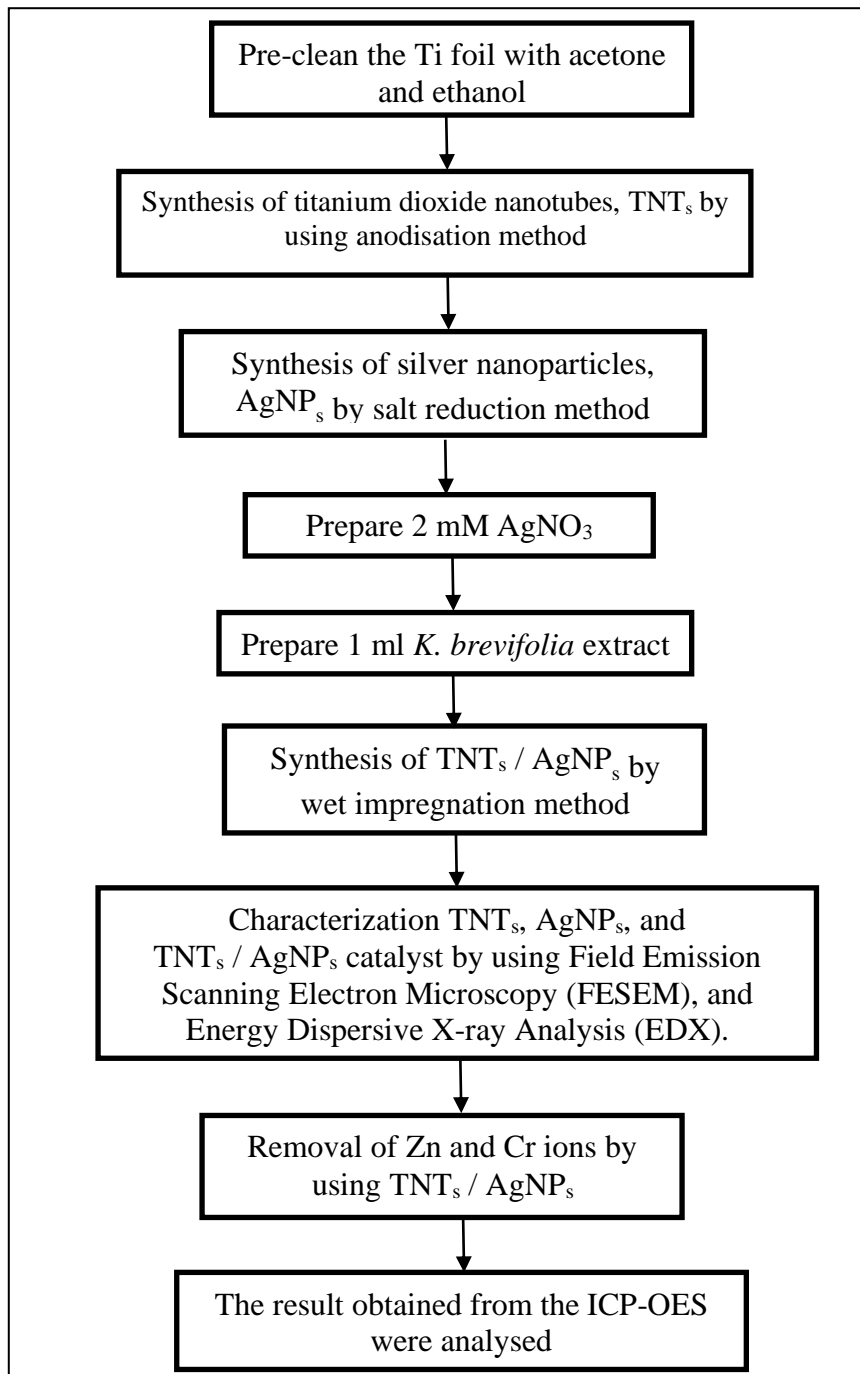
Keywords:

Silver nanoparticles, Titanium dioxide nanotubes, *Kyllinga brevifolia* extract; Photocatalyst; Heavy metals

Objective:

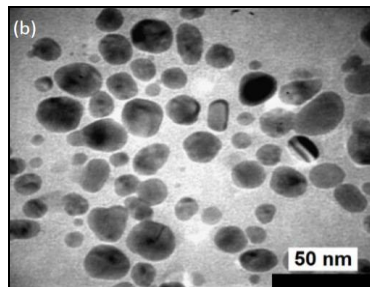
- To synthesis and characterize of titanium dioxide nanotubes (TNT_s) decorated with silver nanoparticles (AgNP_s)
- To evaluate the removal of zinc and chromium ions by using the TNT_s/AgNP_s catalyst

Methodology:

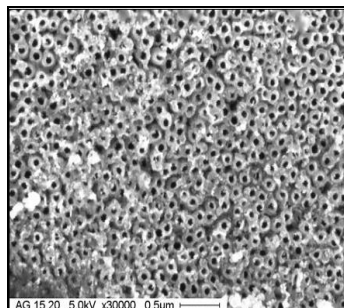


Results:

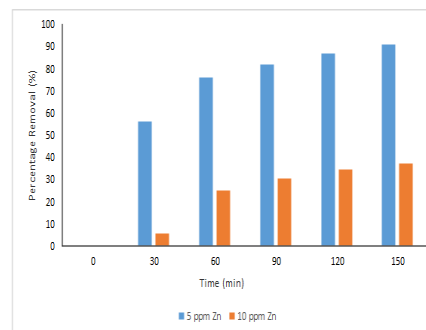
AgNP_s - TEM



TNT_s/AgNP_s - SEM



Photocatalytic



Conclusion:

As a conclusion the modification of TNT_s with AgNP_s were gave higher mechanical stability and spherical shape on the TNT_s / AgNPs. The inner diameter of the TNT_s was 30 nm while the diameter and particle size of AgNP_s were 0.24 nm and 15 nm respectively. Furthermore, on the removal of Zn ions by using TNT_s / AgNPs catalyst, 5 ppm Zn was the highest percentage removal of Zn ions compared to 10 ppm Zn which was 90.81% at the maximum contact time while 10 ppm Zn was only have 37.16% of the percentage removal of Zn ions at the maximum contact time. Besides, the photocatalytic degradation of 5 ppm Zn and 10 ppm Zn imply the pseudo-second order kinetic with reaction rate degradation of Zn ions were $6.667 \times 10^{-3} \text{ min}^{-1}$ and $1.733 \times 10^{-4} \text{ min}^{-1}$ respectively.