

## SIIC062

### MODIFICATION OF ZIRCONIA FOR ENHANCEMENT OF PHOTOCATALYTIC ON HEAVY METAL REMOVAL

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#### **Abstract:**

This study covers the fabrication of zirconia nanotubes modification with other material to remove heavy metal from wastewater. Zirconia has been widely studied due to its various application, chemical and physical properties. As heavy metals are known to have harmful effects to human, animal and environment, therefore, it is important to remove or reduced the concentration of the compound. In this study, comparative study was made based on the synthesis of zirconia nanotubes and removal of heavy metal in wastewater. Experimental work on zirconia nanotubes is doped with iron (II) sulphate heptahydrate by anodization method. This method involves the immersing of electrode in electrolyte of constant voltage. Two method of anodization were used for synthesis of ZrO<sub>2</sub> nanotubes. Power of 60 V was supply for the anodization process to take place with air bubbler to mix the electrolyte. The characterizations and morphologies of the nanotubes were carried out using SEM and EDX. A ring structure on the surface of the foil confirms the formation of nanotubes for 0.5 M concentration of iron solution. As for the removal of heavy metals, it was made by comparative study. Based on previous studies, the use of freestanding zirconia nanotubes gives high degradation of heavy metal however it decreased as the pH increase. A high removal of heavy metal also can be achieved in doping than undoped ZrO<sub>2</sub>. The adsorption of As(III) on undoped and doped ZrO<sub>2</sub> carbon nanowires were 2.58 mg/g and 28.61 mg/g while for As(V) 3.65 mg/g and 106.57 mg/g, respectively. Therefore, doping of zirconia with iron compound may give high rate of removal of heavy metal, thus reduced the pollution of heavy metal in water.

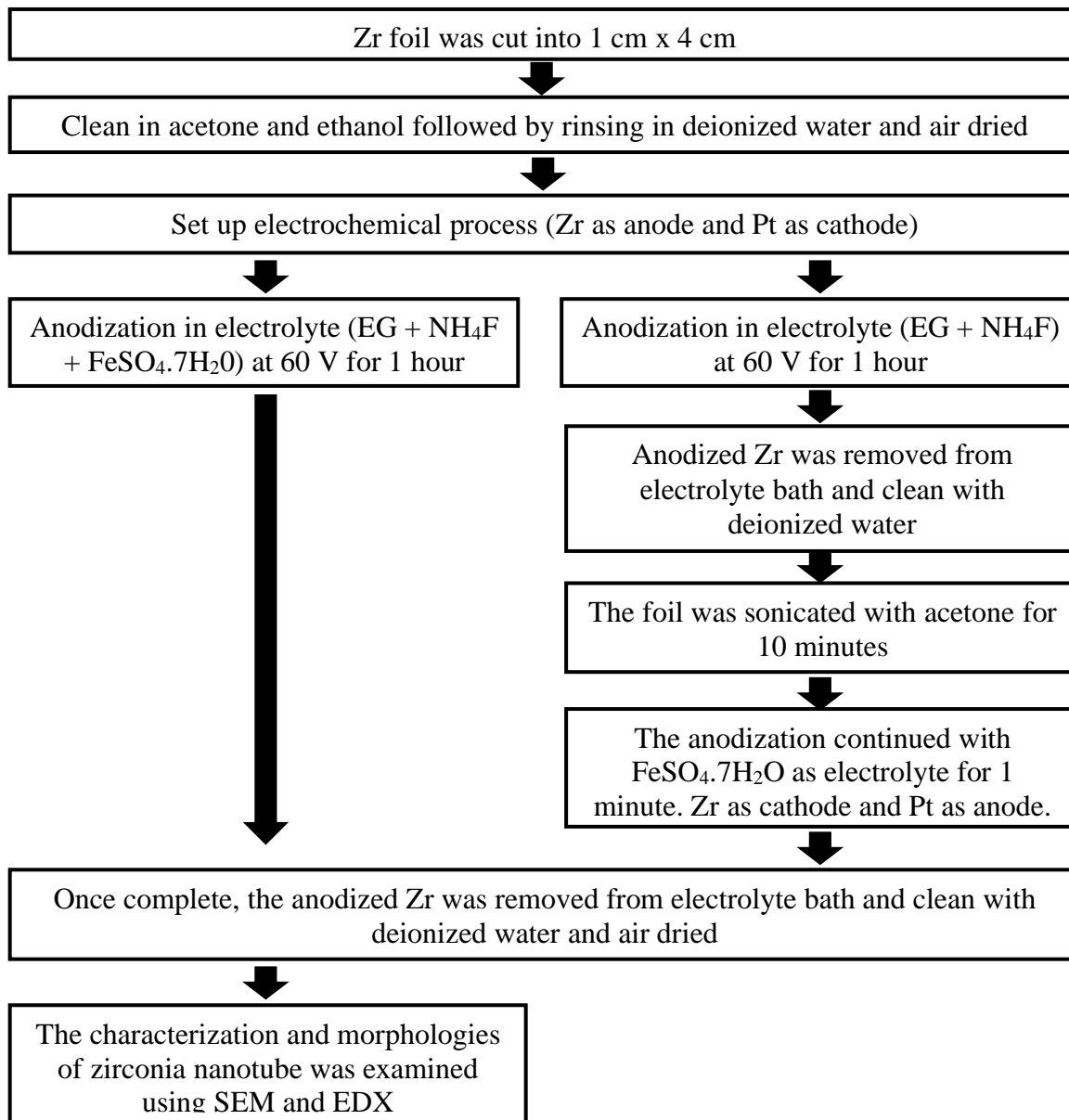
#### **Keywords:**

Zirconia, photocatalyst, heavy metal, anodization, modification




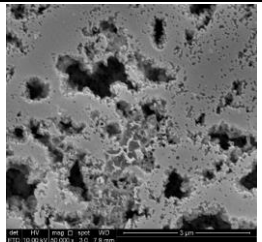
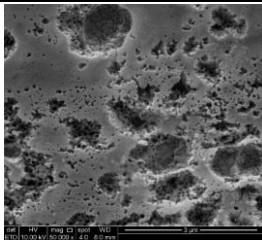
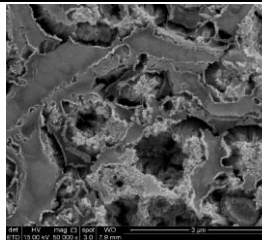
#### **Objectives:**

- To study the modification of zirconia for enhancement of their photocatalytic performance of photocatalyst for removal of heavy metal.
- To compare from literature the removal of heavy metal using modified zirconia photocatalyst










**Methodology:**



**Results:****Method 1**

	0.1 M	0.5 M	1.0 M
Observation			
SEM image			

**Method 2**

	0.1 M	0.5 M	1.0 M
1 <sup>st</sup> anodized			
After sonicate			
2 <sup>nd</sup> anodized			

**Conclusion:**

One of the objectives of this study is to study the modification of zirconia for enhancement of their photocatalytic performance. There are several methods to produce doped zirconia. Anodization is one the method that are currently researched for the synthesis of nanostructured material. In anodization process, electrochemical series was set up with different electrolyte used. The synthesis of zirconia nanotubes through anodization process were carried out to determine the formation of nanotubes during the process. Experiments were conducted based on two method of anodization where  $ZrO_2$  was doped with iron sulphate heptahydrate at different concentration (0.1, 0.5 and 1.0 M). The characterization and morphologies were carried out by SEM and EDX only for the first method due to some limitation. From the result obtained, formation of nanotubes was observed for 0.5 M  $FeSO_4 \cdot 7H_2O$ . Another objective of study is to compare from literature the removal of heavy metal using modified zirconia photocatalyst. Pure zirconia nanotubes were used to remove heavy metals such as chromium and lead. Modification of  $ZrO_2$  gives higher removal capacities compared to pure  $ZrO_2$ . In this study, the research could not further studies due to some limitation. Besides that, researched on removal of heavy metal by anodized modified zirconia nanotubes are limited.