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ELECTRODE REVERSIBILITY OF ELECTRIC ARC FURNACE SLAG FOR DEGRADATION OF ACID ORANGE II

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Abstract:

In this study, Electric Arc Furnace Slag (EAFS) is a type of waste was used as an electrode for degradation of acid orange II (AOII). AOII is an example of dye that produce from the textile industry. The objective EAFS and iron oxide electrode were analyzed to study the electrochemical properties specifically on the reversible reaction for the degradation of AOII using the cyclic voltammetry (CV) and investigate the current and potential of EAFS electrode. CV is mostly technique used in electrochemical process to obtain the information regarding the reaction involved such as redox reaction that occur in the process. The powdered EAFS and iron oxide mixed with resin solution before place on top of the screen-printed electrode (SPE). The dye solution, AOII mixed with 0.5M sodium chloride (NaCl) was added to the SPE. Then, the SPE was connected to the potentiostat then tested for 3 complete cycles using the software NOVA 1.10. In this work, the additional of oxidizing agent which is hydrogen peroxide was used in the dye solution. The CV analysis showed both electrodes have quasi-reversible reaction. However, EAFS electrode showed the peak to peak current ratio that could have unity by increasing the scan rate more than 60mV/s which means the reversible reaction may occur. Then, the reversible reaction occurred as the potential current for anodic and cathodic were in unity. Based on the work done, the peak current was not in similarity which resulted in quasi-reversible reaction. To conclude, the EAFS electrode had higher efficiency for degradation of AOII compared to the iron electrode as the pattern of graph showed the higher tendency towards the reversible reaction compared to the iron electrode.

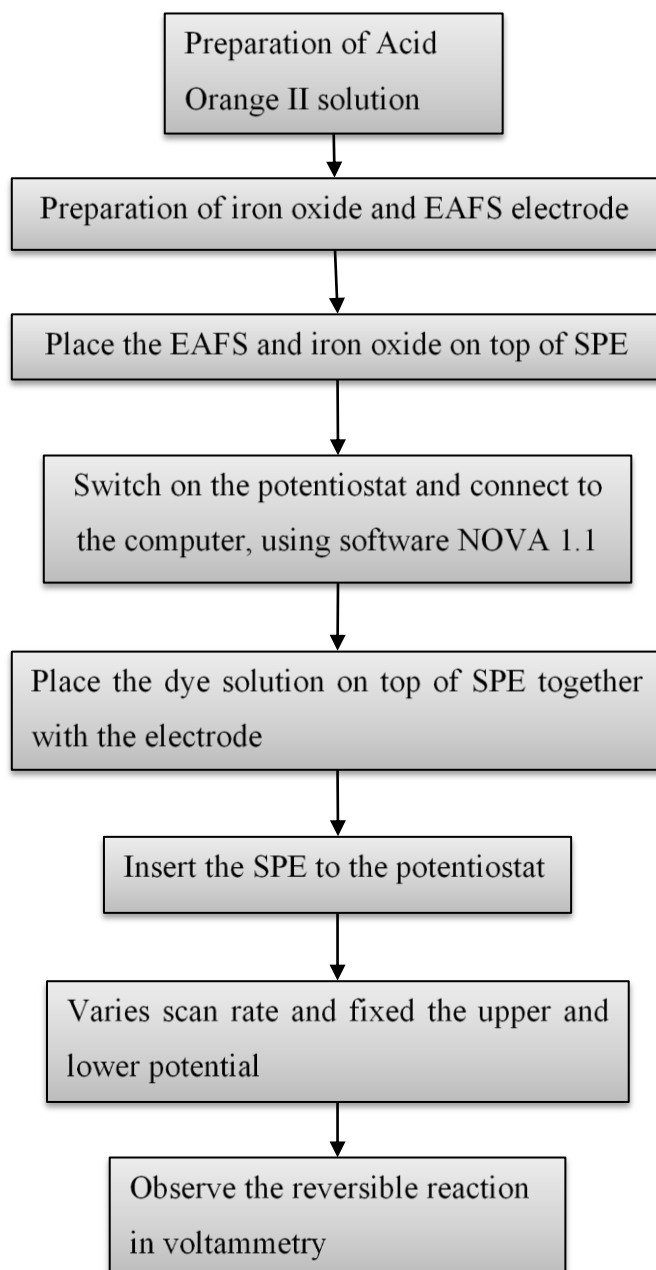
Keywords:

EAFS, Acid Orange II, *reversible*; degradation; cyclic voltammetry

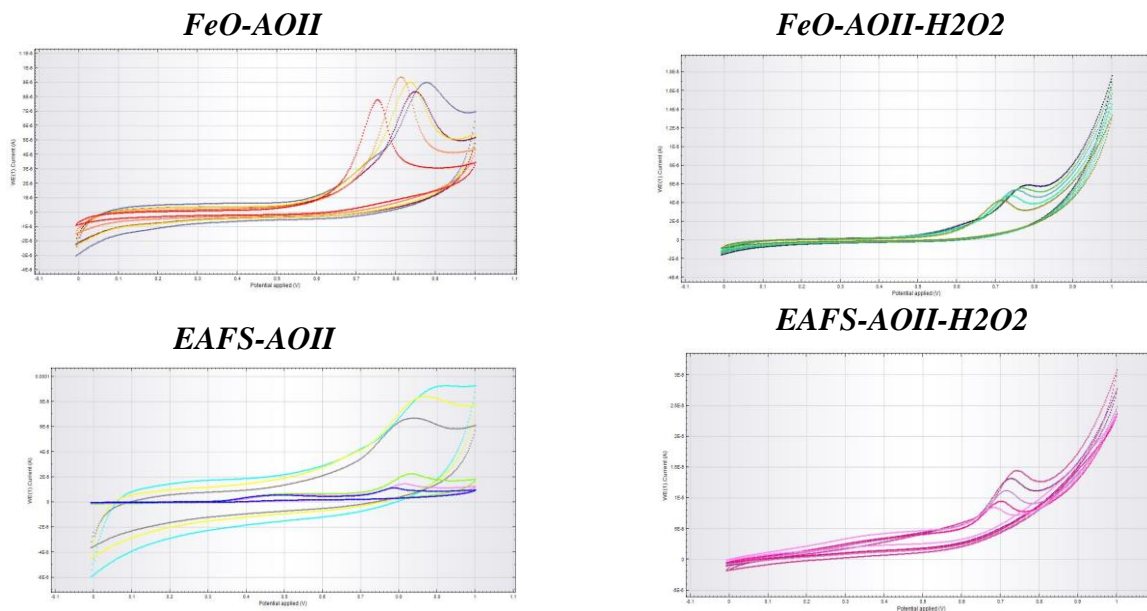
Objectives:

1. To study the electrode reversibility in cyclic voltammogram of electric arc furnace slag in degradation of Acid Orange II
2. To investigate the current and potential of electric arc furnace slag electrode in oxidative of Acid Orange II.

Methodology:



Results:



Conclusion:

The analysis for EAFS and iron oxide electrode had been done to study the electrochemical properties specifically in reversibility studies. The result for EAFS electrode showed the quasi-reversible pattern without additional of oxidizing agent, H₂O₂ in the acid orange dye solution. However, with the addition of H₂O₂, it showed the irreversible pattern. Supposedly, the addition of H₂O₂ help to promote the oxidizing capacity and removal efficiency of pollutants [36]. To compare the results obtained, EAFS electrode more likely have the reversible electrode reaction without additional of oxidizing agent than the iron oxide electrode. The cathodic and anodic potential for EAFS electrode without H₂O₂ showed the highest peak current at highest scan rate which is 60mV/s. To conclude based on the result, the EAFS have more benefit compared to the iron oxide as an electrode in this electrochemical analysis. The additional of scan rate may increase the tendency of the process to have the reversible reaction based on the findings that had been observed.