Removal of Acetaminophen from Water using Electrochemical Treatment

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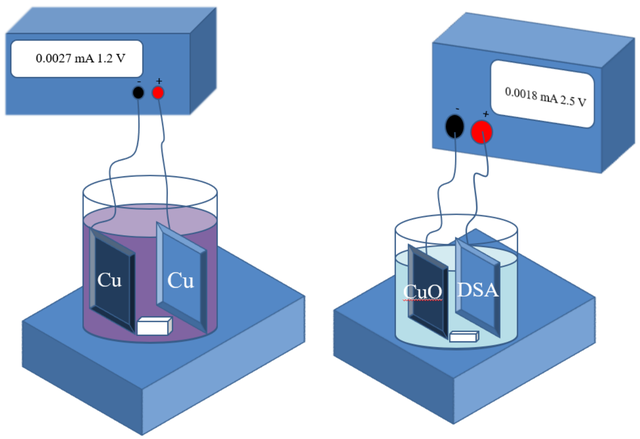
Background

The presence of active pharmaceutical ingredients (APIs) in the environment has been a major concern for environmental scientists. By using Acetaminophen (ACT) as the model contaminant, electrochemical activation of persulfate (PS) to produce sulfate radicals provides an efficient method to degrade API's and their organic content from water.

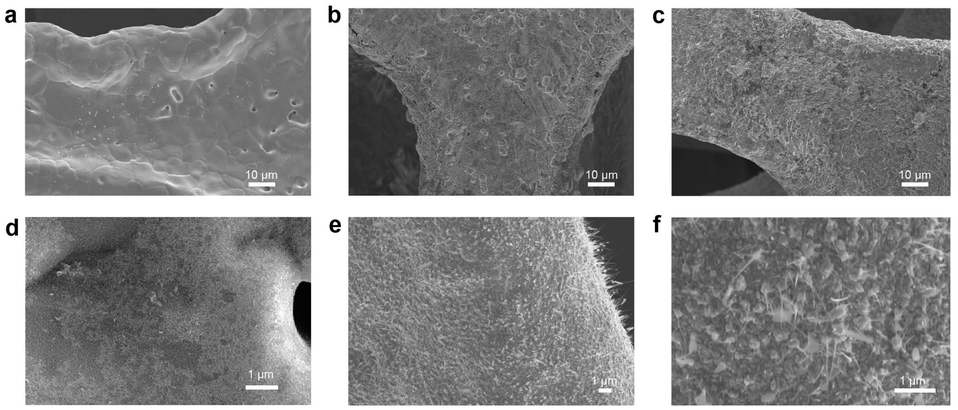
Research Methods

1.) Electrode Synthesis: Anodic oxidation with 3 M NaOH using current density of 3 mA/cm^2 for 1 hour

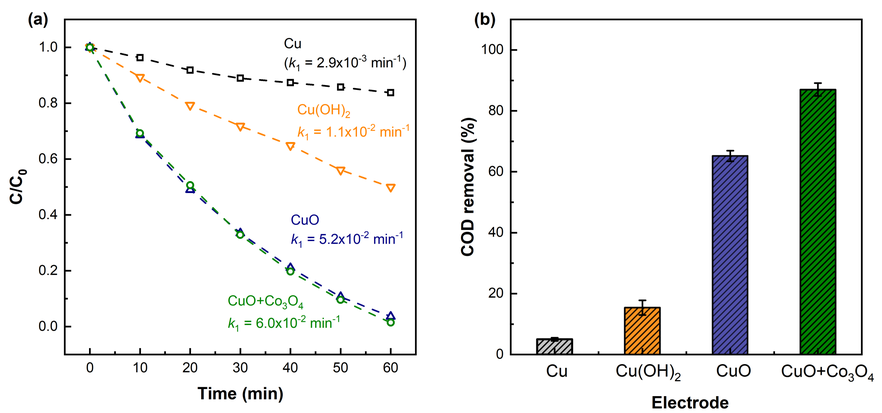
2.) Contaminant Removal: Dehydrated Cu foam as cathode with Dimensionless Stable Anode (DSA) in 10 ppm acetaminophen and 50 mM Na_2SO_4 using persulfate



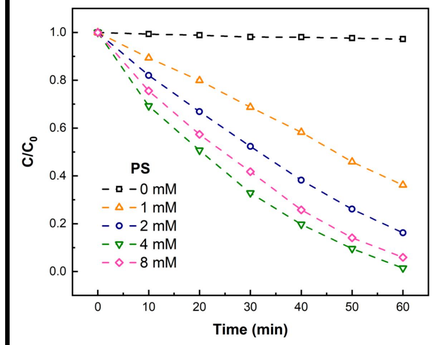
Results

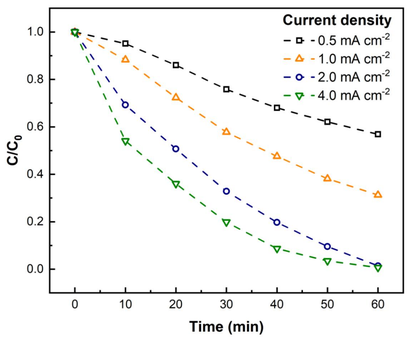


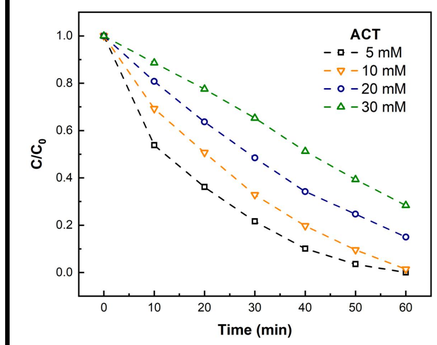
Morphological evaluation by SEM images evaluated the changes after each modification. (a) Cu foam, (b) $Cu(OH)_2$, (c) CuO, (d,e,f) CuO+Co_3O_4



Different electrode configuration was evaluated obtaining (a) different kinetics and (b) COD removal.







Optimal conditions:
CuO + Co_3O_4
4 mM PS
2.0 mA cm^{-2}

Conclusions

- Sulfate radical formation offers high degradation efficiency of organic pollutants.
- Optimal Conditions: Current density of 2 $\frac{mA}{cm^2}$; 10 ppm of Acetaminophen; 4 mM persulfate for 60 min
- Over 90 % contaminant removal with optimal conditions.
- This method may be used for other refractant contaminants such as bisphenol A, sulfamethoxazole, among others.

FURI

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