Enhancement of chlorine on Pd catalyst for H2O2 in-situ synthesis in electro-Fenton system: Kinetics and Mechanism

Linhui Lu[1], Qingli Shu[1], Guiru Zhang[1], Qi Zhang[1], Ping Du[2], and Xuedong Zhu[3]

[1]East China University of Science and Technology
[2]Chinese Research Academy of Environmental Sciences
[3]Affiliation not available

April 16, 2024

Abstract

Palladium-based catalyst has been widely employed in electro-Fenton process for in-situ generation of H2O2. However, the selectivity to H2O2 achieved so far is still far below application level. In this work, a series of Cl-FePd/γ-Al2O3/Al catalysts were prepared by a three-step-impregnation method, exhibiting excellent activity in H2O2 in-situ synthesis and high efficiency in phenol degradation. The characterization results showed that the Cl could assist in increasing the content of Pd0 and reducing the isoelectric point of catalyst, leading to the dramatic promotion in synthesis of H2O2. Moreover, theoretical calculation and kinetics further demonstrated that the Cl doping could facilitate the main reaction in H2O2 synthesis, as well as inhibit side reactions, including the dissociation of O-O bond, hydrogenation and decomposition. Furthermore, plausible mechanism and degradation pathways were elaborated based on ESR and GC-MS results. These findings illustrate the value of palladium-based Cl-FePd/γ-Al2O3/Al catalyst in its application in electro-Fenton process.

Hosted file

`Main Document.docx` available at https://authorea.com/users/443465/articles/712107-enhancement-of-chlorine-on-pd-catalyst-for-h2o2-in-situ-synthesis-in-electro-fenton-system-kinetics-and-mechanism