

纳米零价铁对溶液中PCB77的降解及其影响因素

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Effect of Nano Zero-Valent Iron on Degradation of PCB77 in Solution and Its Influencing Factors

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摘要

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摘要 设计了以溶液初始pH值、3,3',4,4'-四氯联苯(PCB77)初始浓度、纳米零价铁(Fe^0)投加量、纳米零价硅(Si^0)投加量、腐殖酸和环糊精浓度为影响因素的正交试验,研究纳米 Fe^0 降解PCB77时各因素对反应体系中PCB77残留率、氢离子浓度及氧化还原电位变化的影响及其相互关系。结果表明,在溶液初始pH值为4.5,初始 ρ (PCB77)为 $1 \text{ mg}\cdot\text{L}^{-1}$,纳米 Fe^0 投加量为 $10 \text{ g}\cdot\text{L}^{-1}$,纳米 Si^0 投加量为0, ρ (腐殖酸)为 $0.25 \text{ g}\cdot\text{L}^{-1}$, ρ (环糊精)为 $1 \text{ g}\cdot\text{L}^{-1}$ 时,反应2 h后,PCB77残留率最低,为35.2%。溶液初始pH值对反应体系中PCB77的残留率影响最大,纳米 Fe^0 投加量次之;溶液初始pH值对反应体系中氢离子浓度变化影响最大,环糊精投加量次之;PCB77初始浓度对反应体系中氧化还原电位变化影响最大,纳米 Fe^0 投加量次之。

关键词: 纳米零价铁(Fe^0) 3,3',4,4'-四氯联苯(PCB77) 降解 影响因素

Abstract: An orthogonal experiment ($L_{25}5^6$) was designed to have initial pH of the solution, initial concentration of 3,3',4,4'-tetrachlorobiphenyl (PCB77), dosages of nano zero-valent iron (Fe^0) and nano zero-valent silicon (Si^0), and concentrations of humic acid cyclodextrin as affecting factors to study effects of the factors on residual rate of PCB77, concentration of hydrogen ions and changes in redox potential and their relationships. Results show that when initial pH of the solution was at 4.5, initial concentration of PCB77 $1 \text{ mg}\cdot\text{L}^{-1}$, dosage of Fe^0 $10 \text{ g}\cdot\text{L}^{-1}$, concentration of humic acid $0.25 \text{ g}\cdot\text{L}^{-1}$ and cyclodextrin $1 \text{ g}\cdot\text{L}^{-1}$, the residual rate of PCB77 was the lowest (35.2%) after 2 h of reaction. Initial pH of the solution had the greatest influence on PCB77 residual rate, and was followed by dosage of Fe^0 . Initial pH of the solution had the greatest influence on hydrogen ion concentration, too, and was followed by dosage of cyclodextrin. And initial concentration of PCB77 had the greatest influence on oxidation reduction potential, and was followed by dosage of Fe^0 .

Keywords: nano zero-valent iron (Fe^0) 3,3',4,4'-tetrachlorobiphenyl(PCB77) degradation influencing factor

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