

材料化学工程与纳米技术

P-mSA/mCS双极膜的制备及其在电合成2,3,5,6四氯吡啶中的应用

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摘要

以五氧化二磷、磷酸三乙酯和磷酸为反应剂, 制备了磷酸化海藻酸钠(P-SA), 经二茂铁离子改性后作为阳膜层; 用乙酰基二茂铁改性壳聚糖制备了阴膜溶胶(mCS)。将阴膜溶胶流延于阳膜层上, 制备了P-二茂铁-SA/乙酰基二茂铁-CS双极膜(P-mSA/mCS BPM)。测定了双极膜的电荷密度、H⁺渗透性、交流阻抗、IV曲线和SEM。以化学镀方法将金属锌和镍的合金镀在阳离子交换膜层的表面上, 以实现阴极室中的零极距电解。实验结果表明, 以五氯吡啶(PCP)为原料, 经电催化还原脱氯制备2,3,5,6-四氯吡啶(2,3,5,6-TCP), 电流密度30 mA·cm⁻²、电解时间40 min, 电流效率70.1%、产率96%。与传统的Zn还原法相比, 不仅省去了昂贵的金属还原剂的消耗, 而且消除了锌泥对环境的污染。

关键词

[双极膜](#) [磷酸化](#) [五氯吡啶](#) [化学镀](#) [电合成](#)

分类号

Preparation of P-mSA/mCS bipolar membrane and its application in electrosynthesis of 2,3,5,6-tetrachlopyridine

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Abstract

Phosphorylated sodium alginate (P-SA) membrane was synthesized from phosphorus pentoxide, triethyl phosphate and phosphoric acid, and then modified by ferrocene as a linking reagent. Chitosan(CS) was modified by acetylferrocene. P-ferrocene-SA/acetylferrocene-CS bipolar membrane was prepared with a paste method, and was named as P-mSA/mCS BPM. The bipolar membrane was characterized by charge density, H⁺ permeability, impedance, I-V curves and SEM. Zinc/nickel layer was plated down to the surface of cation exchange layer to realize zero polar distance electrolysis in the cathode room. The experimental results showed that 2,3,5,6-tetrachlopyridine (2,3,5,6-TCP[BFQJ]) was electrocatalytically synthesized at the bipolar membrane by degradation of pentachloropyridine. The current efficiency was 70.1%, yield of 2,3,5,6-TCP was 96%, when the current density was 30 mA·cm⁻². Compared with the traditional Zn reduction method, the electro-reduction technology saved the zinc powder and eliminated the pollution to the environment.

Key words

[bipolar membrane](#) [phosphorylation](#) [pentachloropyridine](#) [electroless plating](#) [electrosynthesis](#)

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