

## 4-二甲氨基吡啶催化的界面聚合法制备超支化聚乙烯亚胺复合膜

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**摘要** 为了提高超支化聚合物在界面聚合反应中的成膜性能, 选择 4-二甲氨基吡啶 (DMAP) 作为空间位阻催化剂, 用于催化超支化聚乙烯亚胺 (PEI) 与均苯三甲酰氯 (TMC) 界面聚合成膜。研究了 DMAP 在水油两相中的溶解性能, 发现 DMAP 的适宜用量为底物 PEI 的 8%。傅里叶红外光谱和扫描电镜表征结果表明, DMAP 能够催化 PEI 上更多氨基参与酰化交联, 在聚砜底膜上形成光滑连续的网络状结构。该复合分离膜对 NaCl 的截留率由无 DMAP 催化成膜的 45.2% 提高至 85.4%, 水通量高达 60.8 L/(m<sup>2</sup>·h)。结合吡啶环上 1-叔胺基团及环外的 4-二甲氨基团, 推测了 DMAP 在 PEI 界面聚合反应过程中消除强空间位阻效应的催化机理。

**关键词:** 4-二甲氨基吡啶 超支化聚乙烯亚胺 界面聚合 空间位阻 复合膜

**Abstract:** The promoting effect of 4-dimethylaminopyridine (DMAP) on the interfacial polymerization between trimesoyl chloride (TMC) and hyperbranched polyethyleneimine (PEI) was investigated. The solubility of DMAP in organic phase and aqueous phase was examined and the mass fraction of DMAP to PEI was optimized to 8%. Fourier transform infrared spectroscopy and scanning electron microscopy results showed that when catalyzed by DMAP, almost all the amino groups of PEI were cross-linked with TMC into amide groups, and thus a smooth and integrated layer was formed on the polysulfone support membrane. The rejection of PEI/TMC composite membrane against NaCl was improved to 85.4% as compared with 45.2%. Combined with the donating electron effects of 1-tertiary amine and 4-methylamino groups, the catalytic mechanism for DMAP in this PEI-based interfacial polymerization was proposed.

**Keywords:** 4-dimethylaminopyridine, hyperbranched polyethyleneimine, interfacial polymerization, steric hindrance, composite membrane

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