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咪唑类离子液体混合物吸收CO_2性能研究

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Studies on CO_2 absorption performance by imidazole-based ionic liquid mixtures

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摘要 结合常规离子液体和功能型离子液体在吸收CO_2方面的优势,将两类咪唑类离子液体进行混合,对其吸收CO_2的效果和再生性能进行了实验研究。结果表明,两类咪唑类离子液体混合后流动性明显改善,与CO_2接触气液传质顺畅;常规离子液体[bmim][BF_4]和[bmim][Tf_2N]与胺功能型离子液体[NH_2e-mim][BF_4]混合物较单一的离子液体吸收CO_2的量大,[bmim][CH_3CO_2]与[NH_2e-mim][BF_4]混合后较单一的[bmim][CH_3CO_2]吸收量有明显的减低;随着常规咪唑类离子液体阳离子碳链增长,混合离子液体吸收CO_2的效果变强;与胺乙基功能型离子液体混合吸收CO_2时,阴离子为[Tf_2N]的常规咪唑类离子液体要比阴离子为[BF_4]的吸收效果好;离子液体混合物吸收CO_2后经再生循环利用10次,混合物质量基本不变,循环使用后吸收CO_2性能为初始吸收性能的75%~85%。

关键词: 咪唑类离子液体 CO_2减排 CO_2吸收 再生性能

Abstract: Conventional and functional imidazole-based ionic liquids (abbr. ILs) were mixed based on their advantage and disadvantage on CO_2 reduction. Additionally, CO_2 absorption effect and regeneration performance of imidazole-based IL mixtures were discussed. It was showed that imidazole-based IL mixtures had good fluidity and smooth of transferring CO_2. It had better absorption capacity of CO_2 for the mixtures of [bmim][BF_4] (or [bmim][Tf_2N]) and [NH_2e-mim][BF_4] than the single IL, and lower absorption capacity for the mixtures of [bmim][CH_3CO_2] and [NH_2e-mim][BF_4] than [bmim][CH_3CO_2]. While the cation of conventional imidazolium ILs became longer and the mixtures could absorb CO_2 more obviously, more strong effect was shown on CO_2 absorption with the anion [Tf_2N] than the anion [BF_4] for the conventional imidazolium IL. CO_2 absorption capacity of the imidazole-based IL mixtures had maintained 75%~85% of the initial capacity during 10 times of the absorption/regeneration cycles, while the quality of the regeneration was unchanged.

Key words: imidazole-based ionic liquids CO_2 emission reduction CO_2 absorption regeneration performance

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