Effective absorption of SO₂ by imidazole-based PILs with multiple active sites: Thermodynamic and mechanical studies

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Abstract

In view of the environmental hazards caused by SO₂, the development of efficient SO₂ capture technology has important practical significance. In this work, a low viscosity protic ionic liquids containing imidazole, ether linkage, and tertiary amine structure, was synthesized by acid-base neutralization of tris(3,6-dioxaheptyl)amine (TMEA) and imidazole (Im) for SO₂ absorption. The results showed that the solubility of SO₂ in [TMEA][Im] reached 12.754 mol·kg⁻¹ at 298.2 K and 100 kPa and the ideal selectivity of SO₂/CO₂(1/1) and SO₂/H₂S(1/1) are 141.6 and 11.8 at 100 kPa, respectively. Furthermore, [TMEA][Im] can be reused and the SO₂ absorption performance was not significantly reduced after five cycles. In addition, the absorption of low-concentration SO₂ (2000 ppm) in [TMEA][Im] was also tested. Further spectroscopic research and thermodynamic analysis suggested that the high SO₂ uptake by [TMEA][Im] was caused by the synergistic effect of physical and chemical absorption.

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