

论文

SO₂与Fe₂O₃生成Fe(II)(aq)和硫酸盐的复相反应机理

张秋菊; 王晓; 陈建民; 庄国顺

复旦大学环境科学与工程系, 大气化学研究中心, 上海 200433

摘要:

使用DRIFTS, XPS, HPLC和IC考察了常温、常压和氧气存在下SO₂与Fe₂O₃的复相反应, 结果表明, SO₂在Fe₂O₃表面的反应活性与Fe₂O₃表面含水量密切相关, 表面含水量增加有助于Fe(II)(aq)和硫酸盐的生成. 室温下(T=291 K, 相对湿度68%), 每毫克Fe₂O₃在30 min内可消耗53.6 μg SO₂, 生成12.6 ng Fe(II)(aq)和56.2 μg SO₄²⁻. 反应产物SO₄²⁻的浓度比Fe(II)(aq)的浓度高3个数量级, 表明在生成硫酸盐的复相反应中铁对SO₂氧化具有非常高的催化活性. 提出了Fe(II)(aq)和硫酸盐的生成机理.

关键词: 复相反应 Fe₂O₃ SO₂ Fe(II)(aq) 硫酸盐

Formation of Fe(II)(aq) and Sulfate via Heterogeneous Reaction of SO₂ with Fe₂O₃

ZHANG Qiu-Ju, WANG Xiao; CHEN Jian-Min*; ZHUANG Guo-Shun

Center for the Atmospheric Chemistry Study, Department of Environmental Science & Engineering, Fudan University, Shanghai 200433, China

Abstract:

The formation mechanism of Fe(II)(aq) and sulfate via heterogeneous reaction of SO₂ oxidation on the surface of Fe₂O₃ was investigated at the normal temperature, pressure and in the presence of oxygen by DRIFTS, XPS, HPLC and IC. The results revealed that the reaction activity of SO₂ with Fe₂O₃ was closely related to the amount of absorbed water on the surface of Fe₂O₃, which was favorable for the formation of Fe(II)(aq) and S(VI). Under ambient condition [T=291 K, relative humidity(RH)=68%] within 30 min, for 1 mg Fe₂O₃ with the exhaustion of 53.6 μg SO₂, it could produce 12.6 ng Fe(II)(aq) and 56.2 μg SO₄²⁻. The concentration of the product, [SO₄²⁻], was three orders of magnitude higher than that of Fe(II)(aq), indicating that large amount of SO₄²⁻ production was formed via catalysis by the transitional metal Fe. The reaction mechanism of SO₂ oxidation on Fe₂O₃ is proposed.

Keywords: Heterogeneous reaction Fe₂O₃ SO₂ Fe(II)(aq) Sulfate

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作者简介:

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