

完全熔融状态下SiO₂-Al₂O₃-CaO体系的黏度分析与预测张志文¹;王增莹¹;梁钦锋¹;郭庆华¹;于广锁¹;于遵宏¹煤气化教育部重点实验(华东理工大学)¹

收稿日期 2007-6-25 修回日期 网络版发布日期 2008-4-15 接受日期

摘要

基于网状结构模型概念, 简要分析了SiO₂-Al₂O₃-CaO体系各组分在网状结构中的作用。网状结构模型理论认为Al₂O₃为两性物, Al³⁺易形成四配位, 部分电荷由具有较低场强的碱金属或碱土金属离子补偿。为考察SiO₂-Al₂O₃-CaO体系随n(CaO)/[n(CaO)+n(Al₂O₃)]比值变化的黏度特性, 研究了n(CaO)/[n(CaO)+n(Al₂O₃)]比值在0.4~0.6附近的黏温曲线变化规律。结果表明, 硅熔体黏度随n(CaO)/[n(CaO)+n(Al₂O₃)]比值的增大呈现先缓慢升高后降低的趋势, 但当n(CaO)/[n(CaO)+n(Al₂O₃)]比值为0.5时, 其黏度并非为最大值。基于流体流动特性, 提出了SiO₂-Al₂O₃-CaO体系在完全熔融状态下的黏度预测模型, 并同传统的Urbain模型进行比较。结果表明, 本模型预测效果好于Urbain模型, 预测值同实验值更为接近。

关键词 黏度 硅熔融体 煤气化

分类号 TQ 546

Analysis and Prediction of the Viscosity of the SiO₂-Al₂O₃-CaO Ternary System in Completely Molten State

ZHANG Zhi-wen WANG Zeng-ying LIANG Qin-feng GUO Qing-hua YU Guang-suo YU Zun-hong

Abstract

Based on the theory of random network model, the effects on the structure role in the SiO₂-Al₂O₃-CaO ternary system for each component was analysed. The theory of random network model considers the amphoteric role of Al₂O₃ in the silicate system, and its strong preference for tetrahedral coordination with its charge deficit being compensated by alkaline earth metal cations, Mn⁺ etc. For studying the varied viscosity with the ratio of n(CaO)/[n(CaO)+n(Al₂O₃)] in the SiO₂-Al₂O₃-CaO ternary system, the relationship between viscosity and component with the ratio of that typically in the range of 0.4~0.6 was investigated. The results show that, with the ratio of n(CaO)/[n(CaO)+n(Al₂O₃)] increasing from 0.4~0.6, the viscosity of the silicate melts increases slowly at first, and then decreases fiercely, but when that was at 0.5, the viscosity of silicate melts never reaches the maximum. Ground on the properties of fluid, the mathematical model for SiO₂-Al₂O₃-CaO ternary system in completely molten state was established, which was better than the conventional Urbain model, and good agreement between experimental value and prediction one was obtained.

Key words [viscosity](#) [silicate melts](#) [coal gasification](#)

DOI:

通讯作者 张志文 comingtozzw@163.com

作者个人主页 张志文 王增莹 梁钦锋 郭庆华 于广锁 于遵宏

扩展功能

本文信息

- ▶ [Supporting info](#)
- ▶ [PDF \(317KB\)](#)
- ▶ [\[HTML全文\]\(OKB\)](#)
- ▶ [参考文献\[PDF\]](#)
- ▶ [参考文献](#)

服务与反馈

- ▶ [把本文推荐给朋友](#)
- ▶ [加入我的书架](#)
- ▶ [加入引用管理器](#)
- ▶ [复制索引](#)
- ▶ [Email Alert](#)

相关信息

- ▶ [本刊中 包含“黏度”的 相关文章](#)
- ▶ [本文作者相关文章](#)

- [张志文](#)
- [王增莹](#)
- [梁钦锋](#)
- [郭庆华](#)
- [于广锁](#)
- [于遵宏](#)