

## Accepted Manuscript

Modeling and optimization of porous silica ingot melting during quartz glass synthesis

Qianli Ma, Haisheng Fang, Zhongyi Liu, Shangkun Wang

PII: S1359-4311(17)35919-7  
DOI: <https://doi.org/10.1016/j.applthermaleng.2017.12.062>  
Reference: ATE 11583

To appear in: *Applied Thermal Engineering*

Received Date: 16 September 2017  
Revised Date: 11 November 2017  
Accepted Date: 16 December 2017

Please cite this article as: Q. Ma, H. Fang, Z. Liu, S. Wang, Modeling and optimization of porous silica ingot melting during quartz glass synthesis, *Applied Thermal Engineering* (2017), doi: <https://doi.org/10.1016/j.applthermaleng.2017.12.062>

This is a PDF file of an unedited manuscript that has been accepted for publication. As a service to our customers we are providing this early version of the manuscript. The manuscript will undergo copyediting, typesetting, and review of the resulting proof before it is published in its final form. Please note that during the production process errors may be discovered which could affect the content, and all legal disclaimers that apply to the journal pertain.



# Modeling and optimization of porous silica ingot melting during quartz glass synthesis

Qianli Ma, Haisheng Fang\*, Zhongyi Liu, Shangkun Wang

State Key Laboratory of Coal Combustion, School of Energy and Power Engineering, Huazhong University of

Science & Technology, Wuhan, Hubei, 430074, China

## Abstract

Quartz glass is widely used in modern technologies due to its excellent thermophysical and optical properties. To reduce hydroxyl concentration, a critical impurity affecting optical performance and service life of the glass products, traditional synthesis process of the quartz glass is improved by melting the prepared porous silica ingot in a vacuumed furnace. Since the molten quartz encloses the porous silica ingot, and blocks escape of the gases, originated from hydroxyl or other impurities, the melting pattern should be optimally designed by controlling the operating conditions. In the paper, an integrated model has been developed to study the dynamic melting process of the porous silica ingot, considering heat transfer and large surface deformation. Influences of the heater temperature, the ingot size, the furnace cooling and the crucible design on the melting process are investigated carefully. Based on the analysis, an optimized crucible design with partial sidewall cooling of the furnace is proposed to obtain the preferred melting pattern for enhancing hydroxyl removal.

*Keywords:* quartz glass, optical performance, phase transition, hydroxyl, optimization

---

\*Corresponding author. E-mail:hafang@hust.edu.cn (Haisheng Fang)

Download English Version:

<https://daneshyari.com/en/article/7046274>

Download Persian Version:

<https://daneshyari.com/article/7046274>

[Daneshyari.com](https://daneshyari.com)