
Contents

Foreword	ix
Preface	xi
Acknowledgments	xiii
GLASS MELTING	
Effect of Dissolved Water on Physical Properties of Soda-Lime-Silicate Glasses Udaya K. Vempati and Terence J. Clark	3
Comparison of SEM/EDX Analysis to Petrographic Techniques for Identifying the Composition of Stones in Glass Brian Collins, Gary Smay, and Henry Dimmick	13
FORMING	
Multi Gob Weight Production Xu Ding, Jonathan Simon, Angelo Dinitto, and Andreas Helfenstein	29
Closed Loop Control of Glass Container Forming Jonathan Simon and Andreas Helfenstein	37
Hard Glass—Commercial Progress of Thermally Strengthened Container Glass Ken Bratton, Steven Brown, Tim Ringuette, and Dubravko Stuhne	55
ENERGY AND ENVIRONMENTAL	
Oxygen Enhanced NOx Reduction (OENR) Technology for Glass Furnaces J. Pedel, H. Kobayashi, J. de Diego Rincón, U. Iyoha, E. Evenson, G. Cnossen, and P. Zucca	69

U.S. Air Regulations Involving Glass Manufacturing Steven B. Smith	85
New Combustion Technique for Reducing NO _x and CO ₂ Emissions from a Glass Furnace R.S. Pont, N. Fricker, I. Alliat, Y. Agniel, and L. Kaya	93
Environment and Energy: Flue Gas Treatment and Production of Electrical Power in the Glass Industry Alessandro Monteforte and Francesco Zatti	107
OPTIMELT™ Regenerative Thermo-Chemical Heat Recovery for Oxy-Fuel Glass Furnaces A. Gonzalez, E. Solorzano, C. Lagos, G. Lugo, S. Laux, K.T. Wu, R.L. Bell, A. Francis, and H. Kobayashi	113

REFRACTORIES

Wear of Basic Refractories in Glass Tank Regenerators David J. Michael, H. Edward Wolfe, and Laura A. Lowe	123
Modern and Competitive Regenerator Designs for Glass Industry Sébastien Bourdonnais	143

SENSORS AND CONTROL

Detection of Early Stage Glass Penetration and Weak Refractory Spots on Furnace Walls Yakup Bayram, Alexander C. Ruege, Eric K. Walton, Peter Hagan, Elmer Sperry, Dan Cetnar, Robert Burkholder, Gokhan Mumcu, and Steve Weiser	157
Fast and Objective Measurement of Residual Stresses in Glass Henning Katte	165
Feeder Expert Control System for Improved Containers Fred Aker	177

MODELING

3-D Transient Non-Isothermal CFD Modeling for Gob Formation Jian Jiao, Oluyinka Bamiro, David Lewis, and Xuelei Zhu	185
Modeling of Heat Transfer and Gas Flows in Glass Furnace Regenerators Oscar Verheijen, Andries Habraken, and Heike Gramberg	201

Energy Analysis for Preheating and Modeling of Heat Transfer from Flue Gas to a Granule	207
Liming Shi, Udaya Vempati, and Sutapa Bhaduri	
Laboratory Facilities for Simulation of Essential Process Steps in Industrial Glass Furnaces	223
Mathi Rongen, Mathieu Hubert, Penny Marson, Stef Lessmann, and Oscar Verheijen	
Heat Transfer in Glass Quenching for Glass Tempering	235
Carlos J. Garciamoreno, David A. Everest, and Arvind Atreya	
Author Index	253