228
Accession number:20115114605865
Title:High temperature millimeter wave radiometric and interferometric measurements of slag-refractory interaction for application to coal gasifiers
Authors:McCloy, John S. (1); Crum, Jarrod V. (1); Sundaram, S.K. (2); Slaugh, Ryan (1); Woskov, Paul P. (3)
Author affiliation:(1) Pacific Northwest National Laboratory, 902 Battelle Blvd, MSIN K6-24, Richland, WA 99352, United States; (2) Kazuo Inamori School of Engineering, Alfred University, Alfred, NY 14802, United States; (3) Plasma Science and Fusion Center, Massachusetts Institute of Technology, Cambridge, MA 02139, United States
Corresponding author:McCloy, J.S.(john.mccloy@pnl.gov)
Source title:Journal of Infrared, Millimeter, and Terahertz Waves
Abbreviated source title:J. Infrared. Millim. Terahertz Waves
Volume:32
Issue:11
Issue date:November 2011
Publication year:2011
Pages:1337-1349
Language:English
ISSN:18666892
E-ISSN:18666906
Document type:Journal article (JA)
Publisher:Springer New York, 233 Springer Street, New York, NY 10013-1578, United States
Abstract:Millimeter wave (MMW) radiometry can be used for simultaneous measurement of emissivity and temperature of materials under extreme environments such as in slagging coal gasifiers, where sensors have been identified as a key enabling technology need for process optimization. We present a dual-channel MMW heterodyne radiometer with active interferometric capability that allows simultaneous measurements of sample temperature, emissivity, and flow dynamics. Interferometric capability at 137 GHz is supplied via a probe signal originating from a local oscillator allowing monitoring of sample dynamics such as volume expansion and thickness change. This capability has been used to monitor characteristic behavior between refractories and slag such as slag infiltration, slag melting, viscous flow, foaming, and crucible corrosion by the molten slag. These results show the promise of the MMW system for extracting process parameters from operating slagging coal gasifiers, providing valuable information for process efficiency, control, and increased productivity.
Number of references:15