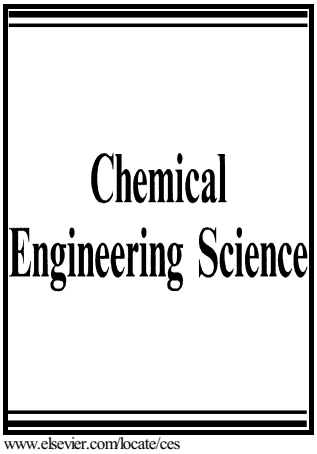

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Tingwen Li, William A. Rogers, Madhava Syamlal, Jean-François Dietiker, Jordan Musser, Mehrdad Shahnam, Swapna Rabha

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THE NETL MFIX SUITE OF MULTIPHASE FLOW MODELS: A BRIEF REVIEW AND RECENT APPLICATIONS OF MFIX-TFM TO FOSSIL ENERGY TECHNOLOGIES

Tingwen Li[1,3*], William A. Rogers[1], Madhava Syamlal[1], Jean-François Dietiker[1,2], Jordan Musser[1], Mehrdad Shahnam[1], Swapna Rabha[1,4]

[1] National Energy Technology Laboratory, U.S. Department of Energy, Morgantown, WV, USA

[2] West Virginia University Research Corporation, Morgantown, WV, USA

[3] AECOM, Inc., NETL, Morgantown, WV, USA

[4] Oak Ridge Institute for Science and Education, Oak Ridge, TN, USA

ABSTRACT

The MFiX suite of multiphase computational fluid dynamics (CFD) codes is being developed at U.S. Department of Energy's National Energy Technology Laboratory (NETL). It includes several different approaches to multiphase simulation: MFiX-TFM, a two-fluid (Eulerian-Eulerian) model; MFiX-DEM, an Eulerian fluid model with a Lagrangian Discrete Element Model for the solids phase; and MFiX-PIC, Eulerian fluid model with Lagrangian particle 'parcels' representing particle groups. These models are undergoing continuous development and application, with verification, validation, and uncertainty quantification (VV&UQ) as integrated activities. After a brief summary of recent progress in the verification, validation and uncertainty quantification (VV&UQ), this article highlights two recent accomplishments in the application of MFiX-TFM to fossil energy technology development. First, recent application of MFiX to the pilot-scale KBR TRIG^{TM} Transport Gasifier located at DOE's National Carbon Capture Center (NCCC) is described. Gasifier performance over a range of operating conditions was modeled and compared to NCCC operational data to validate the ability of the model to predict parametric behavior. Second, comparison of code predictions at a detailed fundamental scale is presented studying solid sorbents for the post-combustion capture of CO_2 from flue gas. Specifically designed NETL experiments are being used to validate hydrodynamics and chemical kinetics for the sorbent-based carbon capture process.

Key words: Multiphase flow, computational fluid dynamics, two-fluid model, gasification, carbon capture, uncertainty quantification

* Corresponding author at: National Energy Technology Laboratory,
Morgantown, WV 26505, USA. Tel.: 1 304 285 4538.
E-mail addresses: tingwen.li@contr.netl.doe.gov, litingwen@gmail.com (T. Li).