



Combustion

Science & Engineering, Inc.

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KWASI FOLI, Dr.-Ing.

Kwasi Foli, Dr.-Ing. (Mechanical Engineering) has over fifteen years of professional experience in the field of CFD. His work in CFD over the past several years has been in the areas of multiphase, turbulent and reacting flow simulation. Dr Foli recently joined CSE as Director of Computational Research. Prior to joining CSE Dr Foli worked in several capacities in the area of CFD. Dr was a post-doctoral research associate at the Brigham Young University's Advanced Combustion Engineering Research Center (ACERC) where he worked as code developer on ACERC's coal combustion code. Dr Foli later worked as Senior Research Engineer at Southern Company Services (SCS) where he was in charge of CFD simulation at SCS's Wilsonville research facility for fluidized bed gasification. Dr Foli later worked as Principal Engineer at Honda Research Institute where he worked on CFD simulation of fuel cells and other related projects. Dr Foli later worked for a period of two years in Germany as Lead Engineer in fuel cell research. Just before moving to CSE Dr Foli worked at MEMC Electronic Materials Inc as Senior Research Engineer. He worked on CFD simulation of granular polysilicon production in fluidized bed reactors. Dr Foli is a US citizen.

EDUCATION

Dr.-Ing., Mechanical Engineering, Technical University of Aachen (RWTH-Aachen), Aachen, Germany, 1991.

Dipl.-Ing., Mechanical Engineering, RWTH-Aachen, Aachen, Germany, 1987.

B.Sc., Mechanical Engineering, UST, Kumasi, Ghana, 1981.

PROFESSIONAL EXPERIENCE:

Principal Engineer and Director of Computational Research, Combustion Science & Engineering, Inc., Columbia, MD. April 2008 to present

Current work involves CFD simulation of instabilities in lean premixed combustors, combustion in complex geometries, and simulation of reactive and non-reactive flows.

Senior Research Engineer, MEMC Electronic Materials, Pasadena, TX, 2006-2008

CFD simulation of chemical reaction in dense multiphase, multi-component flows. In particular: CFD simulation of the transport processes involved in the chemical vapor deposition (CVD) of silicon gas on granular silicon seeds.

Lead Engineer, Sartorius Biotech, Goettingen, Germany, 2004-2006.

Responsible for CFD modeling of transport processes in high temperature PEM Fuel cells. Some of the work involved heat, mass transfer and fluid mechanics analyses of complex processes, optimization of flow passages and temperature distribution in cells, optimization of Membrane-Electrolyte-Assembly such as catalyst loading, thickness and distribution.

Principal Engineer, Honda Research Institute, Columbus, OH, 2000-2004

Worked on Honda Company's Fuel Cell Research Program. Responsible for CFD modeling of reactive and non-reactive flows in fuel cell systems, catalytic surface reactions mostly in micro-scale fuel cell geometries. Worked on

optimization of turbomachinery blade profile using CFD and evolutionary algorithm. Modeling of gas turbine combustors.

Senior Research Engineer, Power Systems Development Facility, Wilsonville, AL, 1997-1999

Responsible for CFD modeling of coal gasification and combustion processes in fluidized beds in complex geometries, multiphase and multi-component flows, particle separation in cyclones, etc.

Post-Doctoral Research Associate, Advanced Combustion Engineering Research Center, Brigham Young University, Provo, UT., 1992-1996.

Work involved coal combustion (CFD) code development and testing. Some of the work involved: Three-Dimensional modeling of turbulent combustion (mainly) of pulverized coal in pilot scale and utility boilers. Integration of pollutant (NO_x and SO_x) submodels in an existing three-dimensional code and subsequent evaluation of the submodels for combustion processes in utility boilers and laboratory-size reactors. Integration of a new radiation model --- the spectral-line based weighted-sum-of-gray-gases model --- in the three-dimensional code to simulate gas radiation. Development of a three-dimensional (coal) combustion code with a new solution algorithm that uses nonstaggered grids. Worked on adaptive grid-embedding capabilities in the version of the three-dimensional combustion code that uses nonstaggered grids.

OTHER RESEARCH-RELATED EXPERIENCE

Experience with the following CFD codes: CFD-ACE+, FLUENT, STAR-CD, STAR-CCM (beginner) GENMIX, STARPIC, PCOC, KIVA, PCGC-2 and PCGC-3, COMPACT.

PROFESSIONAL STANDING:

Member, The American Society of Mechanical Engineers

Member, AIAA

SELECTED PUBLICATIONS:

1. Foli, K., Okabe, T., Olhofer, M., Jin, Y., and Sendhoff, B. (2006), "Optimization of Micro Heat Exchanger: CFD, Analytical Approach and Multi-Objective Evolutionary Algorithms", *Int. J. Heat Mass Transfer*, **49** (5-6), pp. 1090-1099.
2. Okabe, T., Foli, K., Markus Olhofer, M., Yaochu Jin, J., and Bernhard Sendhoff, B. (2003), "Comparative Studies on Micro Heat Exchanger Optimization", In *Proceedings of the 2003 Congress on Evolutionary Computation*, **1** pp 647-654, IEEE Press, Canberra, Australia.
3. Smoot, L.D., Boardman, R.D., Brewster, B.S., Hill, S.C., and Foli, A.K. (1993), "Development and Application of an Acid Rain Precursor Model to Practical Furnaces", *Energy & Fuels*, **7** (6) pp. 786-795.