

Code Written for SOFC Modelling

All code is written in Fortran (predominantly F77) in order to be readily compatible with existing Power Generation and engineering codes. I use the Compaq Fortran compiler (much improved over earlier versions), which runs within MS Visual Studio. Graphical output is produced using a secondary program such as Excel or Matlab (Student Versions without the array size limitation are now available for about £100).

SOFC Simulation

This program models a single SOFC module. It includes heat & mass transfer, chemistry, electrochemistry and electrical phenomena.

Thermodynamic and Transport Properties

This is a set of routines to calculate thermodynamic and transport properties of SOFC gases. Transport properties are calculated by the best-suited method (found as above).

I-V Characteristics

This program calculates polarisation losses and resultant cell voltage for a SOFC.

C-H-O Equilibrium

This program calculates the equilibrium composition of a C-H-O mixture with methane reforming and water gas shift reactions at equilibrium, plus an electrochemical oxidation reaction which consumes a specified percentage of the H₂ produced by the reforming and water gas shift reactions.

Transport Property Equation Evaluation

This program calculates, by several methods, transport properties of mixtures of SOFC gases at the conditions corresponding with supplied experimental data. Using the supplied experimental data it performs a statistical analysis to determine the accuracy of each method.

Black Box SOFC Model

This basic model treats the SOFC stack as a black box having only input and output fuel and air flows, and an electrical work output. The code performs a First Law energy balance taking into account equilibrium conditions (as above), average Nernst Potential, average electrical resistance and activation polarisation losses.