

## 2-D Dynamic modeling of an MCFC stack

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A two-dimensional dynamic model of an molten carbonate fuel cell (MCFC) stack, which conducts integrated indirect internal reforming (IIR) and direct internal reforming (DIR) inside, was developed. The stack model is composed of eight cells and one IIR, which is the smallest repeating unit of an actual MCFC system. In the first step, the whole elements including bipolar plates and electrodes were separately modeled for detailed expression of the system. From this exhaustive model, a reduced model that is easier to manage but accurate enough was derived through step-by-step lumping of the stack elements. As a result, one IIR-plus-two cell model was found to be pertinent for our purpose.