Abstract Submitted
for the DFD10 Meeting of
The American Physical Society

Effects of turbulence on syngas ignition in rapid compression machines MATTHIAS IHME, ASKO SOIMAKALLIO, University of Michigan — Comparisons of ignition delays between predictions and measurements showed considerable differences for high-pressure/low-temperature syngas mixtures. Although effects of reaction-chemistry and large-scale hydrodynamic mixing have been identified as potential sources for these discrepancies, the significance of turbulence and turbulence/chemistry interaction has not be quantified. To address this issue, a theoretical model has been developed in which rapid-distortion theory and a Lagrangian Fokker Planck model have been combined to model turbulence amplification and autoignition in rapid compression machines (RCMs). The model was applied to a realistic RCM-configuration, and parametric studies were performed. From this study, a Damkoehler criterion was derived to quantify the sensitivity of the induction chemistry to turbulence.

Matthias Ihme
University of Michigan

Date submitted: 31 Jul 2010 Electronic form version 1.4