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Chemical Kinetics Model for the Analysis of OME Spray Combustion

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Polyoxymethylene dimethyl ethers (OMEs) are promising synthetic fuels for compression ignition engines because of their high cetane number and low-sooting tendency. We have developed skeletal chemical kinetics models for the analysis of OME spray combustion by applying a directed relation graph (DRG) method to a detailed chemical kinetics model taken from a literature. The model size and reproducibility of ignition delay times after reduction were discussed by changing an error tolerance, temperature and equivalence ratio conditions in the reference data set during a procedure of DRG method. A temperature range for the calculation of ignition delay time in reference data is the greatest impact on the reproducibility of skeletal model. We have also shown that the repetition of DRG method and use of sensitivity analysis have a possibility for further reduction of model. Figures show the comparisons of ignition delay times and species concentration between detailed and skeletal model which includes 76 species.

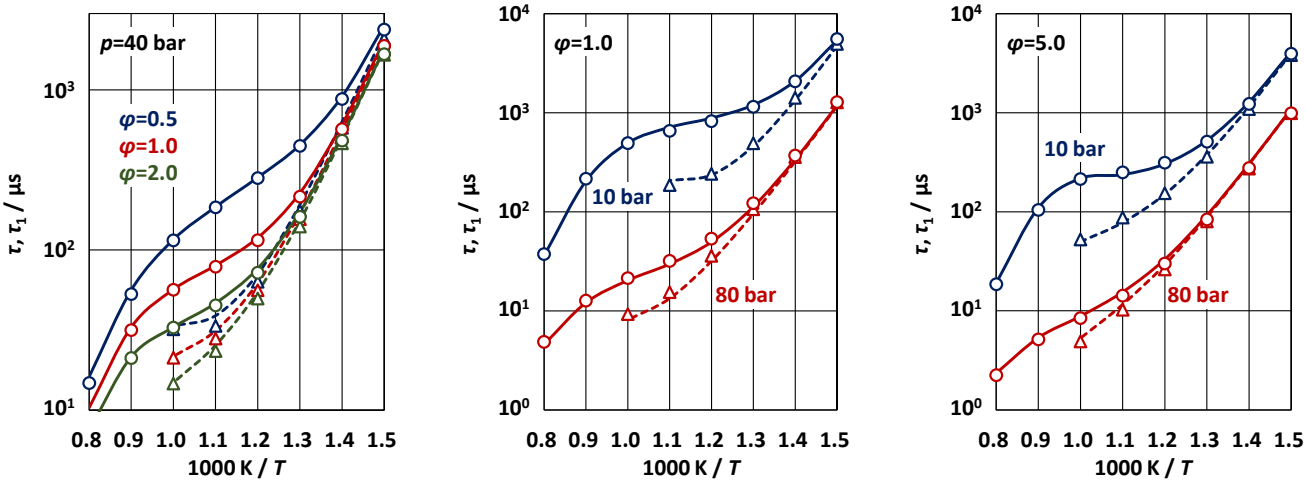

Fig.1 Comparisons of ignition between detailed (symbols) and skeletal (lines) model. Solid lines and circles are ignition delay time, τ, and broken lines and triangles are low-temperature oxidation period, τ_1.

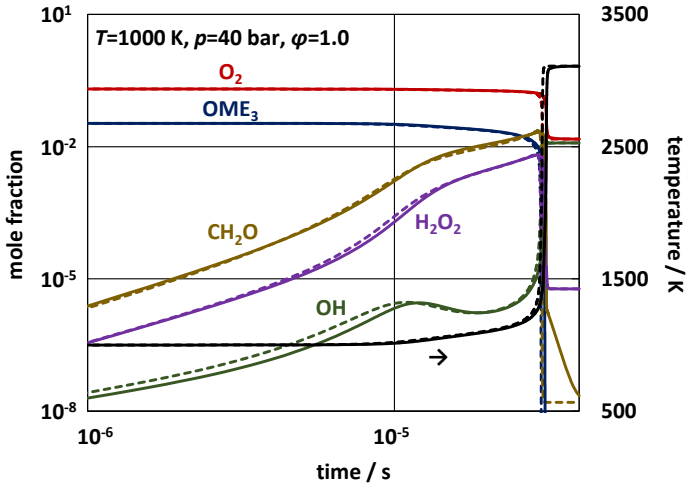

Fig.2 Comparisons of temperature and species mole fractions between detailed (dashed lines) and skeletal (solid lines) model.