Particle Reduced, Efficient Gasoline Engines

EUROPEAN COMMISSION

Horizon 2020 | GV-2-2016 | Technologies for low emission light duty powertrains

GA # 723954

Deliverable No.	PaREGEn D1.11	
Deliverable Title	Baseline version of gasoline kinetics including PAH, RANS	
	3D CFD, soot model and 0D SI-SRM tool	
Deliverable Date	2019-09-30	
Deliverable Type	REPORT	
Dissemination level	Confidential – member only (CO)	
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Approved by	Simon Edwards	2019-09-29
Status	FINAL	2019-09-29

Publishable Summary

The overall objective of Work Package 1 (WP1, Advanced Combustion Technologies) within the PaREGEn project is to establish a solid basis for model-supported design and control based on an in-depth understanding of the in-cylinder particle formation processes.

The objective of the task reported here is the development of reduced mechanisms for gasoline fuel combustion and polycyclic aromatic hydrocarbon (PAH) formation applicable in computational fluid dynamic (CFD) simulations, with specific emphasis on soot formation. The chemical mechanisms can be used to gain understanding of in-cylinder combustion and, thereby, support the design process of low emission gasoline engines.

This document gives information about the performance of a reduced gasoline surrogate scheme and a library based soot model developed within PaREGEn (Project Number 723954), WP1, it is deliverable D1.11.

A baseline reaction scheme for a gasoline surrogate was reduced from 475 species to 198 species. The reduced reaction scheme contains the major fuel components ethanol, toluene, n-heptane and iso-octane, and can thus be used as an Ethanol-Toluene Reference Fuel (ETRF) surrogate. Further sub-models for NOx chemistry and formation of poly-aromatic hydrocarbons predict the same emission formation as the detailed scheme. The reduced reaction scheme was compiled in a standard format and it is compatible with the soot model in all LOGE software solutions, and in CFD software capable of processing standard formatted reaction mechanisms.

The approach for tabulated chemistry using a combustion progress variable is described. The derivation of a NOx model, a moment based and section based soot model for the Combustion Progress Variable (CPV) approach is outlined.

The tabulated chemistry approach is coupled with a commercial CFD code (CONVERGE) and a modified spark-ignition (SI) engine tutorial case, with wall impingement, was simulated for different fuels and equivalence ratios. The results of this arbitrary engine case look reasonable.

Acknowledgement

The author(s) would like to thank the partners in the project for their valuable comments on previous drafts and for performing the review.

Project partners:

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1	RIC	RICARDO UK LIMITED
2	DAI	DAIMLER AG
3	JLR	JAGUAR LAND ROVER LIMITED
4	BOSCH	ROBERT BOSCH GMBH
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This project has received funding from the European Union's Horizon2020 research and innovation programme under Grant Agreement no. 723954.